IN THIS ISSUE: Building the Agricultural Load in the West

JOURNAL OF ELECTRICITY

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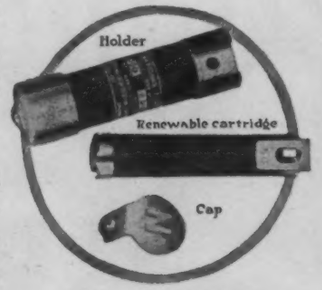

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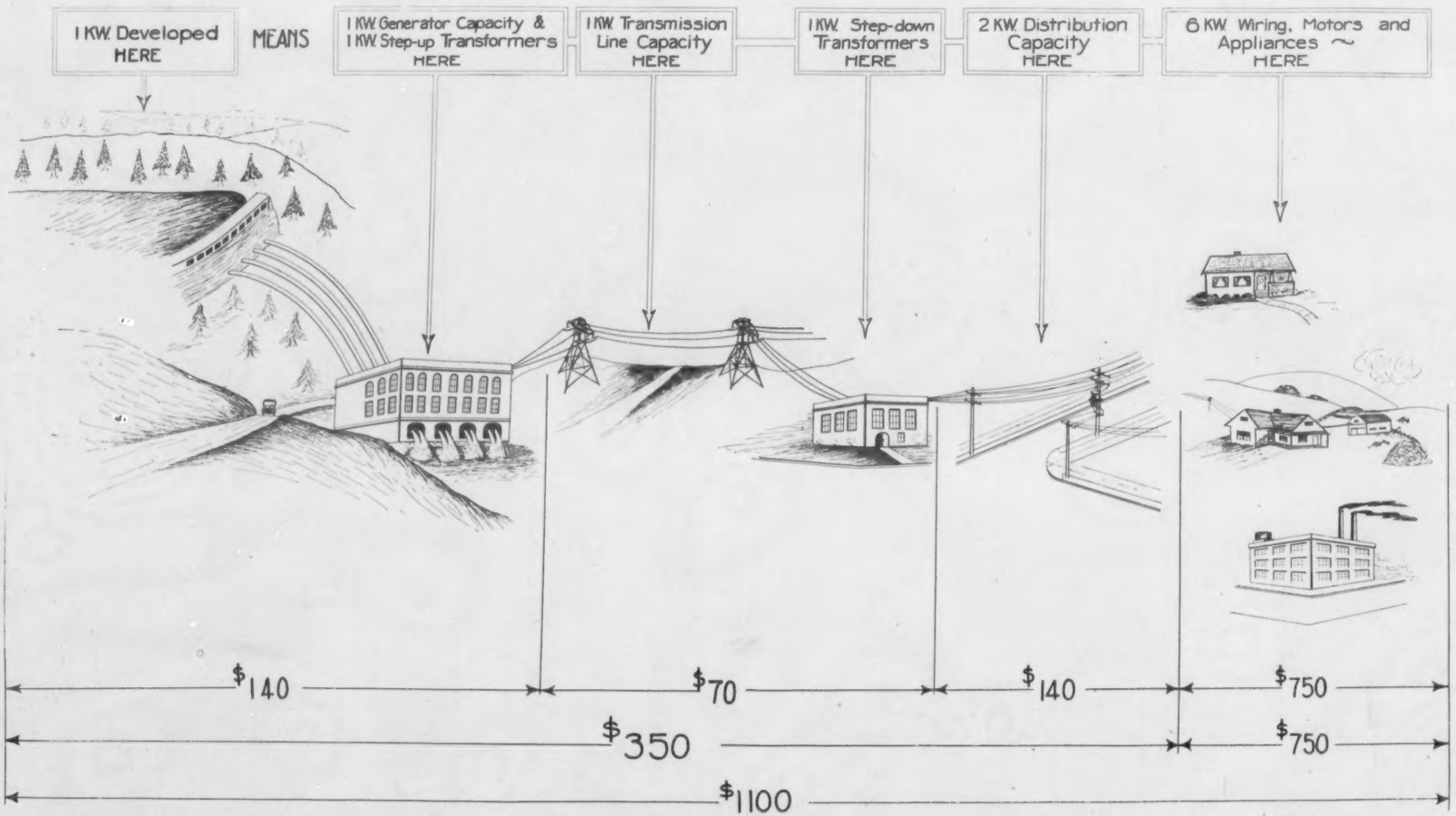

WHEN THE DOLLAR STARTS ROLLING IN PUTTING KILOWATTS UPON THE LINE

Here is a wonderful pictorial representation of what happens within the electrical industry for every kilowatt of energy developed from our waterfalls in the West. In agriculture, in industry and in the home, the additional sums of money involved over and above the electrical investment, must represent many times this vast array of figures. The estimated present program of power development on the Pacific Coast is approximately 140,000 kw in new generator capacity per year, or $19,600,000 in generator capacity, $9,800,000 in transmission equipment, $19,600,000 in distribution installation, and $105,000,000 per year in wiring (including labor), motors, lamps and appliances. ¶ This chart was prepared by John M. Morris of the Westinghouse Electric & Mfg. Company, Los Angeles, by means of data furnished through the Southern California Edison Company and the Journal of Electricity.

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JOURNAL OF ELECTRICITY

DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 45 SAN FRANCISCO, NOVEMBER 15, 1920 Number 10

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Western Thanksgiving...

For west winds chill with the sunset tide,
For trees on a bronzing slope,
For the fresh, moist soil of the country side,
For the heart's unending hope;
For the feel in the hand of a goodly task,
For adventure unexplored,
For the will to seek and the faith to ask—
We render thanks, oh Lord.

For blessed silences of night
Once hideous with sound,
For green things stretching toward the light
Where blood once stained the ground;
For clean hands and the call to build
Onward constructively,
For all the future, unfulfilled—
We render thanks to Thee.

For hearts unbowed with a world's despair,
Searching anew for the treasure;
For the clear, clean thoughts of the young who dare
To build to a newer measure;
For the West with its youth and its wide frontier,
And its challenge to keener living;
For its call to the strength of the pioneer—
We offer our thanksgiving.

—C. G.

California's Great Irrigation Project

It is only fitting that in this issue of the Journal of Electricity, which is devoted to the uses of electricity on the farm, some mention be made of one of the many vast projects which are now being considered in the West. The map which accompanies this issue shows the scheme which Col. Robert B. Marshall, for a number of years chief geographer of the United States Geological Survey, has presented to the people of California to convert the great interior valley of California, composed of the Sacramento and San Joaquin valleys, into one big irrigation project.

Such projects as these are necessary for the development of the West, and in justice to the great mind which conceived this plan of diverting rivers from their channels and putting them to useful work, an investigation of the feasibility of the plan should be made. A committee should be appointed by the state, to consist of a contracting engineer, a civil engineer, a hydraulic engineer, an electrical engineer, representatives of the power companies, representatives of the irrigation districts involved, representatives of the state engineering department, the state water commission and the state railroad commission. Besides these, representative men from the banking and bond houses and various big commercial projects of the state should be consulted by the committee suggested above, to determine whether or not the project could be handled by a bond issue as proposed by Colonel Marshall. The report of such a committee would be authoritative, and the people of California would be willing to abide by its decision.

This committee should not only investigate and report upon this project suggested by Colonel Marshall but upon all the possibilities for the development of the waters of the state, both for irrigation and hydroelectric power. The scheme to develop the great interior valley of California is but one example of the constructive thinking that is needed in the upbuilding of this great empire of the West, and all of these should be considered and carefully investigated by competent committees.

The question is not as to the possibility of such a scheme but as to the practicability of it. With the wealth of California in her soil and in her hydroelectric resources, this seems to be an opportunity to combine the two to the best advantage of the people of the state. If the plan is feasible at this time then let us proceed to carry it out with all possible dispatch, and if it is not feasible then let it stand as the vision of a man who lived before his time, and let us pass the idea along to our children as an ideal to be striven for.

DIARY OF AN OLD-FASHIONED FARMER'S WIFE

4:00 a.m. Rise and dress by candle light.

MORE ELECTRICITY NEEDED ON THE FARM

WOOD PULP POSSIBILITIES IN SOUTHEASTERN ALASKA

It is estimated that there are about one hundred million acres of forest and woodland in the territory of Alaska, of which a large proportion in the southeastern district is especially adapted for use in the making of paper pulp. An abundance of water power awaits only the industrial demand for its development. One paper company has already taken advantage of this situation to establish a pulp mill in this region and government records show that there is sufficient raw material and power at hand to supply twenty more continuously.

Building the Agricultural Load

Perhaps the most characteristic element in the power company business of the West is the importance of the agricultural load. So outstanding is this feature of Western conditions that it will be a surprise to many people to learn that the farm demand is one of recent growth, the first educational work along these lines being carried out some eight or ten years ago by California companies. Although, of course, the special arid climate of much of the western area has had to do with the phenomenal growth of this load, nevertheless its extent may fairly be credited to the foresight and liberal policies of the power companies of this region.

In a survey made by the Journal of Electricity the results of which appear on another page of this issue, the situation in California has been analyzed as an example of what can be done in the agricultural field. The farm load in that state, which is greater than that of the entire remainder of the United States put together, is shown as the direct outcome of a development policy on the part of the companies concerned. Rates were low, the city customer rightly being allowed to bear some of the burden of a rural development which indirectly benefited him. Extension policies were liberal. One instance is on record of a power company which built an extension line at its own expense for 148 miles across desert country in order to connect up a single farm. The entire intervening district has since fed on to that same line and amply justified the daring of this pioneer work. Today, of course, the situation is somewhat less spectacular, but Western rates still appear extremely low to those familiar with similar conditions in the middle West and Eastern states.

All this, more than anything else, serves as a testimonial to the advantages of the rural load. The skepticism of those who looked upon it as disproportionately seasonal has vanished before the records of 75 per cent and higher load factors upon California systems which serve agricultural districts. The tendency now is toward a greater development of the domestic load upon the farm, as offering a means of bettering the individual load factor and thus improving the situation beyond even its present limits. The California experience is of interest, both in its historical significance and in the details of its handling—and may well serve as an example to other regions which are developing along similar lines.

Pacific Coast Jobbers' Association

It is questionable if there has ever been a more helpful gathering among electrical supply jobbers than that which took place at Del Monte during the last semi-monthly period. The occasion was the quarterly convention of the Pacific Division of the Electrical Supply Jobbers' Association.

There has long been a deep-felt need for definite statistics on what actually happens when one dollar is set rolling in investments of hydroelectric equipment, and it is interesting to see that this gathering brought out in its open session the very interesting and important fact that for each kilowatt of hydroelectric equipment installed, a total of $1100 is put into play in the electrical industry from the time the energy is taken from its native haunts in the mountains until the time it is delivered as light or power in the busy city, the farm or the home, a hundred or so miles distant. Not only was this fact brought out, but the segregated units of investment were analyzed, showing where this $1100 is spent.

Deeper than this, however, was the interesting and timely information given by John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company, as to why the West may look for unprecedented prosperity during the next ten-year period; and by A. N. Kemp, comptroller of the Southern California Edison Company, who pointed out in a scholarly manner definite reasons why rates might well be fixed on security investment issues as suggested by the California Railroad Commission, taking into account proper rewards for efficiency that will bring returns to the public, to the utility company and to the individuals in that company when economies are introduced. These matters are presented in fuller detail in other parts of this issue, and need no further emphasis here.

Wholehearted appreciation is due to the Pacific Division of the Electrical Supply Jobbers' Association for this new and effective effort on their part to be of assistance to the industry throughout the West. It will be remembered that it is to this Association, perhaps more than to any other, that the West owes a debt of gratitude for the splendid cooperative activity that now distinguishes this section of our nation. It was ten or twelve years ago that the seeds of cooperation were sown in discussion leading toward the harmonizing of the different branches of the industry. These first seeds were sown at the sessions of this Association, and unquestionably it was in these early constructive thoughts that the splendid ideals of W. L. Goodwin, now so effectively being put into practice throughout the East, had their origin. From this source, too, must have sprung much of the helpful pre-formative discussion that made possible the organization of the California Electrical Cooperative Campaign, which was perfected during 1917 at the Riverside Convention of the Pacific Coast Division, N. E. L. A.

While it must not be said that any one branch of our industry in the West is to receive more credit than any other in the splendid working out of this cooperative ideal, still it is but right to put on record the early pioneer work of the Pacific Division of the Electrical Supply Jobbers' Association.

Electric Construction in Washington

The present law in Washington covering the subject of construction work in hydroelectric practice should be repealed. Forceful attention was called to this law in the issue of the Journal of Electricity for October 15, 1920, under the title "Selling the Railroad Commission." The law as now in force, or as proposed to be put in force in the new year, will bring incalculable damage to the utilities of that commonwealth. The law is retroactive, necessitating extensive replacement of power company equipment to be completed by 1922. Men and materials for this work all have to be obtained within this time, and yet a one thousand dollar fine for every offence, with each offence made accumulative, is the penalty for failure to comply. Under our present system of regulation it is the people of a community who have to pay for foolhardy laws such as this. This matter not only affects the commonwealth of Washington, but also certain other commonwealths of the West where similar laws have been attempted. Men of the industry would do well to use every opportunity possible to rescind this enactment in the state of Washington.

The Burden of Margins

Over a year and a half ago, at one of the contractor-dealer meetings in the West, the manufacturers were quite severely criticised for not providing a greater margin on the sale of motors. At that time it was brought out that unquestionably manufacturers would be glad to provide the additional margin if the facts of the case required such; it was also brought forcefully to the attention of the contractor-dealers that they themselves were the only people who could provide the manufacturers with the real facts as to their cost of doing business, and the request was made for such statistical information. To date nothing has been forthcoming. Here is statistical data that contractor-dealers can no longer afford to refrain from gathering.

A ray of light, however, is already beginning to shine, for we are reliably informed that in recent months contractor-dealers in the West have called in certified public accountants to audit their books, and it is confidently expected that at an early date, over the certified public accountant's signature, will appear the following information: First, the financial foundation of the business that has been investigated, which will include the capital invested, inven-

ONE OF THE LARGEST AGRICULTURAL LOADS IN THE WEST

The rice industry of California is a recent development which has risen from nothing to a crop of over twenty-one million dollars per year within the last five years. In spite of the power shortage of this year, the installed capacity of motors used by this industry increased from 20,629 to 29,798 hp. and the current consumption from 19,250,419 kw-hr. in 1919 to 25,135,357 kw-hr. in 1920. This was in spite of the fact that warnings of the water shortage sent out before the planting season caused a curtailment of the acreage planned. The rice industry, further, was the first to be cut down in power by the power administrator and in consequence over 10,000 kw. in gasoline engines and small steam plants were installed in the fields to supplement electric power. This is only one instance of the development possible in Western agriculture under the stimulus of electric service.

tory and other items of interest; and second, the operations of the business, including gross sales, overhead charges, profits, and the like. A summary of such statistics as this will undoubtedly give some idea as to what the true facts of costs are. If these facts demand greater margins, no manufacturer will fail to recognize the situation. If, on the other hand, the facts of the case show that the margins are already sufficient, and to get the benefits of them it is the responsibility of the contractor-dealers to practice economies and better merchandising methods, then the contractor-dealers in turn must recognize the situation.

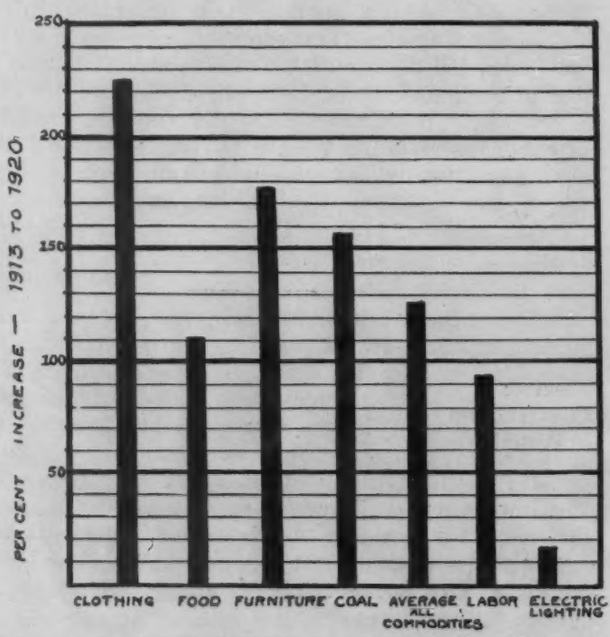
The Next Convention of the A. I. E. E.

The news that Salt Lake City has been chosen as the meeting place for the 1921 Convention of the American Institute of Electrical Engineers has a special significance to the electrical industry in the West. For the first time in the history of the Institute the annual convention is to be held in a truly Western city. This fact should be borne in mind by all the local sections west of the Rocky Mountains, and they should cooperate in every possible way with the Utah Section to make this convention the best ever.

The creation of the Federal Water Power Commission has directed more than ever the attention of electrical men to hydroelectric development, and as the West contains nearly 70 per cent of the undeveloped water power and more than 27 per cent of the developed water power in the United States, it is only right that this great body of electrical engineers should choose the West as the gathering place. This convention will give a wonderful opportunity to Western engineers to show some of those records for which the West is famous and of which the West is justly proud. Let us all help the Utah Section of the A. I. E. E. in every way possible to make this convention a success, so that in the coming years a Western city will always be considered a logical meeting place for this great aggregation of engineers.

New Advances in Telephony in the West

Along with the splendid progress that is being made in hydroelectric development throughout the West wherein many world records in engineering achievements are being surpassed, it is interesting to note that the telephone coupled with radio activity is not lagging behind. Recent announcement was made, for instance, that the great radio station at Bordeaux, France, is sending out longer wave lengths than any thus far in use, this design having been perfected at Palo Alto, California. Statistics from telephone service and operation throughout the United States, particularly in the large cities, show that the two great cities of California outdistance any other cities in the nation in intensive use of the telephone, San Francisco leading all cities, not excepting New York, Chicago or Philadelphia, and Los Angeles following next behind San Francisco. But one of the most interesting phases of new development is that consummated by the Pacific Telephone & Telegraph Company about the middle of July last whereby radio connection has been made from San Pedro, California, to Catalina Island in such a way that a citizen at San Francisco or any other city of the West served by this company desiring to telephone to Avalon on Catalina Island may do so in the ordinary way. This message is transferred automatically by wireless telephony from San Pedro over to Catalina Island and sent again on the regular telephone switch exchange. A telephone conversation said to be a world's record was carried on recently between the Avalon station and the steamer Gloucester, off Philadelphia, over 4,100 miles of wire and wireless. Such advances as this indicate the large activity and vision that pervade all branches of the electrical industry throughout the West.



ELECTRIC LIGHT RATES AND THE HIGH COST OF LIVING

Increases in utility rates were not only the last of all to be made, but they are much lower than those of other commodities, according to the Illinois Committee on Public Information. The above chart, which is compiled almost entirely from government figures, gives an idea of how little the electric utility industry has to fear from a drop in the cost of living. Unlike clothing and similar commodities, it neither benefits nor suffers from fluctuations in market conditions, except as the general prosperity and growth of the community is affected. With the optimistic prophecy for the continuing growth of the West within the next few years which is presented elsewhere on these pages, public utility companies in this district may look forward to a period of continuing expansion.

Vast Growth in Agricultural Uses of Electricity

It is interesting to note that while the West for some years now has led the world in the uses of electricity on the farm, still a beginning only has been made. Three years ago the Journal of Electricity, after a survey of the situation in the West concerning agricultural uses, set forth the fact that there were in California some 10,000 installations of electric motors on the farm. Since that time the growth has been phenomenal and this record has been outdistanced by three hundred per cent. The California farmer now uses more mechanical power per acre than any other farmer in the United States, a recent survey showing that

over 33,500 electric motors are now in use on California farms. According to Professor L. J. Fletcher of the Division of Agricultural Engineering of the University of California, the great power companies feeding the San Joaquin and Sacramento valleys had a connected agricultural load of 302,000 hp. as of June 30, 1920, the motors averaging between 8 and 9 hp. Phenomenal as this use seems to be, even this is but a beginning, for in the San Joaquin Valley alone, fed by one great power company, it is estimated that while but about 245,000 acres are today included in the agricultural pumping load, some 3,000,000 acres still await development.

This growth is typical of conditions throughout the West—of the great district along the Columbia River in Washington and Oregon, of the fertile valleys of Montana, and of the inter-mountain regions surrounding Salt Lake City.

A Time For All Things

When Moses came down from Mt. Sinai, according to the good book, he carried two stone tablets and on one of these was carved the words, "Six days shalt thou labor." The growing tendency is to cut this time down and some of the present day business men are not content with reducing it to five days but needs must take vacations two or three days in the week by devoting most of the day to the game of golf. Aside from the thought of a service shirked, it is a poor example to set the men below, who are apt to feel that they too can loaf all of the time that the "boss" is on the links. Beyond even the present urge for production, the principle of every man a worker, is the only safe basis on which a nation can rest and an ideal which pictures success as unproductive leisure is a dangerous one. The so-called captains of industry are today setting the example so that now every man who can by stretching his imagination, call himself his own boss, thinks that it is necessary to play golf at least three times a week to show the public and his competitor that he is a successful business man. The office boy of today has an ambition not to conquer the world but to be able to do the nine holes in one less than par.

The Tree Planting Movement and Power Lines

During recent months those interested in the power industry in Oregon have been concerned over a movement which has gained headway in that state to beautify the highways by the planting of shade trees. The electrical men have been heartily in favor of this movement in general, but have foreseen that when fully grown these trees may later prove a menace to power lines and a continual source of trouble. With this end in view an effort has been made to have only the smaller types of trees planted and low spreading varieties or shrubs substituted for the more troublesome species.

This experience may well serve as an example in other states. The tree planting movement is becoming general, both as a tribute to our soldier dead and also in the beautifying of highways, a project quite properly encouraged by the forestry interests and the federal authorities. It is in no way the part of the power company to discourage this laudable zeal—but it is a matter of proper forethought to consult with agricultural and forestry officials as to what species of tree may be suggested in cases where power lines already border the roads and might be seriously hindered. The public is quite ready to appreciate the point, and will welcome a constructive suggestion where a mere objection, although possibly effective, would arouse ill feeling.

Heavy Heating in the Home

The so-called headlight heaters and other types of quick and mobile heating have long since become popular in the home. There is, however, much good work to be done in the study and investigation of the possibilities of heavy heating in the home—such as the radiator placed in the fire-place and other types of this nature.

Great uncertainty exists as to the proper rates that should be instituted for such installations in order that the business thereby secured may be self-sustaining. No utility company in the West at the present time has made a complete study of this situation. The residential diversity factor that is created and the effect upon the primary as well as other substation peaks, and other factors involved in power delivery, are matters that merit the research of the engineer. There is no question but that heating of this nature has a possibility in districts having mild climate such as that prevailing in California and some of the Southwestern states, but the extent to which its uses should be advocated depends of course entirely upon the results of investigation. Some two years ago a very profound research was undertaken in this matter at Spokane, Washington, and there it was found practically impossible to devise rates within reason that could handle such loads in the climate prevailing in that section. The entire subject, however, presents such fascinating proportions in the way of new uses of electricity in the home that it certainly calls for immediate and thorough investigation.

The New Journal Service

The rapid progress which the electrical industry is now making in the improvement of existing appliances and machinery is always of interest to the man connected in any way with the industry. Consistently following its policy of being of service to the industry, the Journal of Electricity with this issue is adopting a new form of handling its "Latest in Everything Electrical" department. With the adoption of three columns instead of two and the use of more illustrations it is thought that the page will be more attractive and will better serve its purpose. A circular letter has been sent out to all the large manufacturers of the United States offering them the use of this page as an advance agent, to be used only for new material and electrical apparatus that is of particular interest to the West. Western apparatus will be given the preference, as the Journal of Electricity believes in the upbuilding of the West as an industrial center. This new service is but one of the many ways in which the Journal of Electricity is assisting in this upbuilding.

Building the Agricultural Load

(Electrical service for agricultural districts has been one of the features of electrical development in the West, where the demands of irrigation, coupled with the enterprise and generosity of the power companies in the matter of extensions and rates, have fostered an especially large agricultural load. The following article presents important data collected by the Journal of Electricity, showing methods of handling the industrial load in the West, with special reference to California power companies.—The Editor.)

Agriculture undoubtedly forms the backbone of the prosperity of the West. The first pioneering days when mining and stock raising were the major industries have given way, even in the frontier districts, to the day of the farmer. Recent statistics from Montana indicate that even in that stronghold of mining, agricultural products have exceeded mining output in value annually since 1917. The West is just now entering upon the third stage in its growth with a more intensive city growth and an industrial and commercial development which are a natural outgrowth of the production of the raw materials.

Intensive Electrification in Western Rural Districts

The agricultural load is therefore one of major importance to the power companies of this region. The unusual per capita use of electricity in the West, which averages 2.2 times that for the entire nation, is particularly applicable to farm conditions—and the prosperous agricultural districts of all Western states are looked upon as especially fertile fields for the sale of household and farm conveniences. In addition to this extensive use of electricity for domestic and general power purposes, the outstanding feature of the Western agricultural load is undoubtedly the large block of power which is used for irrigation pumping. This particularly centers in regions of arid climate such as the Southwest and Intermountain states, California probably representing the most intensive development along this line. Idaho and Utah have long been looked upon as irrigation centers and the eastern portion of Washington has many areas where electric pumping is required. The recent dry years in Montana have focused interest in that state upon the possibilities of irrigation with the result that electric pumping may soon become a feature of the agricultural load of that region.

The Southwestern states, of course, are entirely dependent upon irrigation for their agricultural development. It is estimated that ten million acres of agricultural land in the states west of the Rocky Mountains lies above the reach of gravity irrigation.

In order to ascertain just what the agricultural situation in the West was, as far as the power companies were concerned, the Journal of Electricity prepared and sent out a questionnaire to power companies throughout the West. Returns were very scattered, reasonably complete data being secured from the California district alone. This district, however, may be looked upon as an example of the ultimate development possible along this line in other Western states, with slight variations dependent upon historical and geographical differences, and its conditions are here analyzed as typical.

The total connected agricultural load in hp. for seven of the most important California companies is given as 375,708 hp., the largest single return being that of the Pacific Gas & Electric Company, who list a total of 167,701 hp. under various agricultural classifications. The district south of the Tehachapi reports the next heaviest load, with 135,000 hp. reported for the Southern California Edison Company. Another extensive pumping area is that of the lower San Joaquin Valley served by the San Joaquin Light & Power Corporation, with a pumping load of about 27,000 hp.

Several years ago the Pacific Gas & Electric Company sent over the lines of the Northern Electric Railway a demonstration car showing uses of electricity on the farm and in the home. This was visited by over 6000 persons and proved most effective as an educational campaign.

Educating the Farmer

All of the California companies report a very active policy of education and follow-up in agricultural districts carried on at the time the development was being instituted. It is interesting to find that this farm load is one of recent growth, most of the companies not reporting any activity along that line until about 1912. Various policies were adopted in the different districts. The Pacific Gas & Electric Company sent out a demonstration car over the lines of the Northern Electric Railroad which proved very successful in arousing interest, the exhibit being visited by practically every farmer in the district covered. Demonstrations were also given by the company in irrigating, cooking, heating, etc. Several companies report the extensive use of advertising matter sent to the farmer and reaching him through the papers that he reads. Among these are the Southern California Edison Company and the Southern Sierras Power Company. All the companies are active through their district superintendents and commercial agents and give special service to the farmer in seeing that the layout of his plant is the best for his purposes and in giving service after the installation is made. The success of these efforts is

to be judged from the fact that most of the companies are giving up their active campaign in recent years, the farmer being so well sold on the subject of electricity on the farm that in most regions of the state applications have been greater than the companies were able to fill.

The Santa Clara Valley district in California is probably the most congested area—electrically—of any rural district in the world, practically every street and lane being paralleled by a power line. Owing to the fact that it is a fruit-growing area the irrigation load comes early in the off season.

The present tendency of the power company is to concentrate upon the domestic load upon the farm with the idea that a higher individual load factor may thus be obtained. Winter irrigation and the diversity of crops and climate, as well as the other loads which supplement the agricultural on all systems, have given the California companies on the whole a very high annual load factor—but, of course, much of the distribution equipment in agricultural districts must be maintained for a load which is heavy only during the summer months. A household use of electricity and a general use of power for driving farm conveniences would nicely balance this discrepancy, the heaviest load here of necessity coming at a time when power is not being used for irrigation purposes. This use is already very general, as may be judged from the fact that more electricity is used upon the farms of California than in the entire remainder of the United States; but active campaigns are still carried on by many of the companies to introduce cooking and heating more extensively upon their rural lines.

Diversity of Rates for Agricultural Service

Rates on the whole are extremely favorable. In analyzing the situation here, perhaps the outstanding feature may be said to be the diversity of rates for agricultural service in the different regions of the state. There are two explanations for this, one historical and the other based upon the wide differences in climate and in the nature of crops between the various districts. When the agricultural load was first conceived as a possibility in the state there was, of course, no way of working out how much power would be used with a given installed capacity, nor the conditions under which this use would develop. A flat yearly rate was therefore adopted, usually of about $50 per horsepower-year. This did away with the necessity of installing meters, as well as the expense of meter reading over sparsely settled districts, and for some time worked very well. As the value of water was more and more realized, however, the electric motors were more and more overworked to supply the pumps, until the time came when it was no longer possible for the power company to supply power at the return allowed. In consequence, the flat rate has in most places been supplanted by a metered rate, although it still exists in some few instances. The present tendency is to allow an annual charge based upon the size of the installation, plus a kilowatt-hour charge graduated downward depending upon the amount of current used. The details of this type of rate again vary in different districts, depending upon local conditions.

All the Western power companies carried on more or less extensive campaigns in rural districts to educate the farmer. Above is shown a typical booklet distributed by a power company.

In general it may be said that the rate allowed for power on the farm has been very low, with the recognition on the part of the power company and the railroad commission alike that this was necessary during the period of the development of the country. Owing to the special expense of maintain-

DIARY OF AN OLD-FASHIONED FARMER'S WIFE

4.10 a.m. John pumps six pails of water for family use.

MORE ELECTRICITY NEEDED ON THE FARM

ing a distribution system for lighting in a rural district, lighting rates have been somewhat higher in these districts than in the cities, but it may fairly be said that power rates on the whole averaged somewhat lower than similar rates for industrial uses. The tendency at the present time is to increase these rates slightly until they bear the full share of their burden of the expense of generation and distribution.

During the year 1920 special conditions obtained, owing to the acute power shortage expected and experienced and in consequence a special rate was allowed by the Railroad Commission in some cases which fixed no minimum charge, but allowed payment upon a strict kilowatt-hour consumption basis. It was felt that the knowledge that he was paying exactly for what he used, would induce the customer to be more saving in his consumption of power. With the relief of the power shortage, however, the ready-to-serve and standby charge will undoubtedly be resumed as the more equitable basis for all concerned.

Typical Rate Schedules

Typical rate schedules as now in practice are given as follows:

Pacific Gas & Electric Company

This is the rate which covers about 90 per cent of the agricultural power installations on the company's lines.

RATE

(a) **For installations of less than 50 hp.:**

First	500 kw-hr. per meter per month	3.2c per kw-hr.
Next	500 kw-hr. per meter per month	2.7c per kw-hr.
Next	2000 kw-hr. per meter per month	2.2c per kw-hr.
All over	3000 kw-hr. per meter per month	1.7c per kw-hr.

Minimum Charge: $7.00 per hp. per year but not less than $30.00 per year

(b) **For installations of 50 hp. and over:**

Size of Installation—hp.	Rate Cents per kw-hr.	Annual Minimum Charge per horsepower
50 hp. to 49 hp. inclusive	2.2c	$ 7.00
50 hp. to 99 hp. inclusive	1.7c	7.00
100 hp. and over	1.5c	7.00
100 hp. to 499 hp. inclusive	1.2c	14.00
500 hp. to 1499 hp. inclusive	1.1c	14.00
1500 hp. and over	1.0c	14.00

Fifteen per cent surcharge is made in addition to the above charges. Any installation may obtain the rates for larger sized installations by guaranteeing the rates and minimum under the larger installation.

Southern California Edison Company

The following basic schedule covers a large portion of the district of the Southern California Edison Company, with optional schedules for those who desire to meet special conditions.

GENERAL RATE

Capacity of Installation	Rate
Less than 5 hp	3.75c per kw-hr.
5 hp. but less than 15 hp	3.25c per kw-hr.
15 hp. and over	2.75c per kw-hr.

MINIMUM CHARGE

Capacity of Installation	Minimum Charge
Less than 5 hp	$1.00 per hp. per month, but not less than $2.00 per month.
5 hp. and over	$6.00 per hp. for an irrigation season of six consecutive months, payable at the rate of $1.00 per hp. per month during the six consecutive months.

OPTIONAL RATE

(1) For installations of 5 hp. and over and for a guaranteed minimum of $12.00 per hp. per year, payable at the rate of $2.00 per hp. per month for an irrigation season of six consecutive months, the energy rate to be:
2.25c per kw-hr.

(2) For a guaranteed minimum of $1.00 per hp. of connected load per month, but not less than $100.00 per month, for an irrigation season of six consecutive months, the energy rate to be:
2.25c per kw-hr.

(3) For a guaranteed minimum of $1.00 per hp. of connected load per month, but not less than $200.00 per month, for an irrigation season of six consecutive months, the energy rate to be:
2.0c per kw-hr.

SPECIAL MINIMUM CONDITIONS

(1) Pumping plant contracts operated under General Rule, and Optional Rate (2) and (3) where monthly minimum is specified, may be made with accumulative minimum, provided that the minimum shall be for amounts of 25% in excess of the straight monthly minimum. Such accumulative minimum to be upon a six months' or yearly basis, payable in monthly installments.

(2) For the remaining six months of the year not included in the irrigation season to which minimum applies, no minimum to be charged, under General and Optional Rate as designated above, except when the accumulative minimum is on a yearly basis, but regular energy rate to apply.

(3) Any installation may obtain the rate for larger size installation by guaranteeing the minimum under the larger installation.

San Joaquin Light & Power Corporation

These rates cover general agricultural service and represent the type of rate allowed during 1921 without minimum charge provisions in the interest of conserving water and power. They are subject to revision some time during the year 1921.

GENERAL AGRICULTURAL SERVICE

Installations with connected load of from 3 to 6 hp.:
First 125 kw-hr. per month per hp. connected ..... 2.4c kw-hr.
All over 125 kw-hr. per month per hp. connected ..... 1.4c kw-hr.
Installations with connected load of 7 hp. and over:
First 125 kw-hr. per month per hp. connected ..... 2.0c kw-hr.
All over 125 kw-hr. per month per hp. connected ..... 1.4c kw-hr.
No minimum charge during the year 1920.

Special rates are arranged for lighting, heating, cooking and domestic power, these as a rule coming under separate schedules. The power rates in application on agricultural service in California as a whole will work out to about 2.5c per kw-hr. on the larger installations, the figure of course varying depending upon the schedule upon which rates are figured.

Financing Rural Extensions

To those familiar with the extension policies of the Eastern and Middle Western states where the agricultural load is not so generally sought after, the methods of financing extensions in practice in California are exceptionally generous. The general policy is for the companies to finance any extension up to the point where it will bring profitable returns. The method of determining this point is worked out in slightly different ways by the different companies, but figures out to about the same conclusion, that the company is willing to put in at its own expense an amount equivalent to three times the guaranteed annual income. If the cost of the extension is greater than this, the farmer is expected to advance the money, which will then be allowed him in amounts which bear a direct proportion to his monthly bill, varying with the different companies from 20 per cent to 50 per cent. Where the anticipated income is less than 20 per cent of the expenditure required, it is customary to ask a guarantee of the customer that the annual return to the company will come up to 33 1/3 per cent of the cost of extension.

A summary of the extension policies of the various companies may be given as follows:

Pacific Gas & Electric Company

General Agriculture:

Extensions made at company expense up to 3 times anticipated annual income.

If anticipated annual revenue less than 1/3 cost, the business permanent, the company will pay up to 3 times annual revenue, remainder to be advanced by consumer.

If revenue for any three years up to tenth year exceeds total cost of installation, excess to be refunded to consumer. The revenue for the tenth year for figuring refund shall not be figured as more than average for preceding three years.

Rice:

Extensions made at company expense up to 2 times anticipated annual revenue.

If cost more, difference to be advanced by consumer.

Refunds to be made, if income for any two consecutive years up to tenth exceeds cost of installation, tenth year to be figured at average of the two preceding years.

Southern California Edison Company

Extensions made at company's expense up to 2 times anticipated annual revenue.

Where more than twice and up to 3 times anticipated annual revenue, difference to be advanced by customer.

Advance refunded at 50% of monthly bills.

Where estimated annual income less than 1/5 of cost, entire amount to be advanced by consumer, not to be refunded; or guarantee of income to be made by consumer.

San Joaquin Light & Power Corporation

Extensions made at company expense up to 3 times annual revenue.

Where cost more than 3 times but less than 5 times annual revenue, cost to be advanced by consumer, to be refunded at 20% of monthly bills.

Customer may construct such part of line so that cost to company not more than 3 times annual revenue.

Customer may guarantee income at 1/3 cost of installation.

Extensions not usually made where revenue will be less than 1/5 cost.

Great Western Power Company

Extensions made at company's expense up to point of profitable returns.

Beyond this point, cost advanced by consumer and refunded at 20% of monthly bills.

Southern Sierras Power Company

Extensions made at company's expense up to equivalent of anticipated annual revenue.

Where cost greater but not more than 3 times anticipated annual revenue, consumer shall advance the difference, to be refunded on basis of 50% of monthly power bills.

Where estimated revenue exceeds 35% of cost, customer may pay total cost, receiving 6% on advance, refund to be made at 25% of monthly bills.

Where revenue more than 20% but less than 33 1/3% consumer to pay entire cost to be refunded at basis of 20% of monthly bills. Or customer may pay for part of line and come under one of above classifications.

San Diego Consolidated Gas and Electric Company

Extensions made at company's expense up to 3 times the anticipated annual gross revenue.

If cost greater, the difference to be advanced by the consumer as a deposit.

California-Oregon Power Company

Where cost of extension $100 or less, made at expense of company where annual revenue 40% of cost of extension.

Where cost over $100, made at expense of company if contract for 3 years guaranteeing annual revenue of 70% cost of installation.

If contract for three years guaranteeing annual revenue greater than 40% of installation, consumer shall advance sufficient to reduce cost to company to one and one-half times guaranteed annual income. This advance to be refunded to customer on basis of 20% of monthly bills.

If contract for 3 years guaranteeing annual revenue greater than 30% of installation, consumer shall advance entire cost of extension, this amount to be refunded on a basis of 20% of monthly bills.

No extension to be made where guaranteed income does not equal or exceed 30% of the cost of extension.

Where guarantee not acceptable, consumer shall advance entire cost of extension, to be refunded upon above basis.

At the present time a new basis for the determination of extension expenses is being looked for which will determine more fairly exactly what share the company can afford to bear with profit to itself than the present more or less arbitrary 33 1/3 % rule. The intention back of the various rulings, however, is one of liberality, with the idea that the agricultural load is one worth encouraging and one which can only prosper under conditions as favorable as possible to the consumer.

The situation in California is of course, not wholly typical of other Western conditions. Returns from Arizona, where the electric pumping load is an advantageous supplement to such irrigation projects as that of the Salt River Valley, would indicate that extensions here are made entirely at the farmer's expense, but as this is a cooperative organization, conditions are of course not strictly comparable.

The Telluride Power Company of Utah reports rates of $6.00 per hp. per month, which figure out about 1.11c per kw-hr. Extensions are made at the cost of the customer, being later refunded at the rate of 25% of his power bill during a contract period of five years.

On the whole the agricultural load is looked upon very favorably in the West and special efforts are made to make electric service attractive to farmers. The returns to the power companies on this type of load as indicated by the responses would seem to have amply justified this policy.

FARM MOTOR INSTALLATION

The accompanying picture shows an installation of a 5-hp. motor operating a grain crusher, hay cutter and root cutter. Since the photograph was taken a milking machine and separator have been added to the same line shafting.

The same consumer has also installed a 10-hp. motor, 220-volt, three-phase alternating current, for operating a silo filler. It is controlled by a double throw switch, enabling the company to install a transformer for capacity 10-hp. instead of 15, and also reduces the monthly minimum charge to $5.00 instead of $7.50.

The average monthly consumption for the last 12 months has been 51 kw-hr.

This motor operates a grain crusher, hay cutter, root cutter, milking machine and separator. The installation is on a British Columbia farm.

DIARY OF AN OLD-FASHIONED FARMER'S WIFE

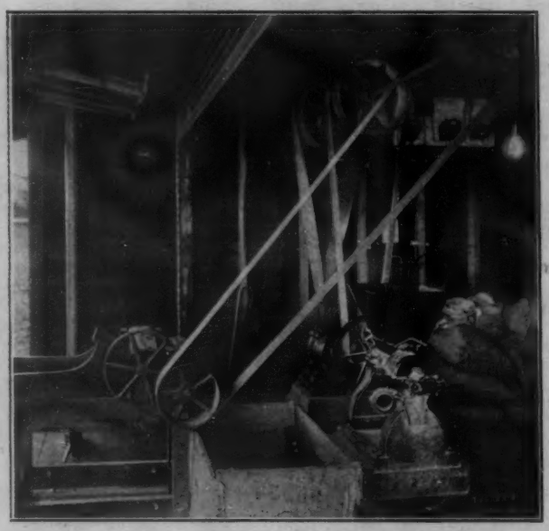
4:45 a.m. John and boys milk 72 cows by hand. Good appetite for breakfast.

MORE ELECTRICITY NEEDED ON THE FARM

Electrifying the West's Most Important Industry

WHERE THE FARMER IS THE POWER COMPANY'S BEST CUSTOMER

Electric lights in the farm buildings are among the greatest benefits which electricity brings to the farmer. Not only are they clean, convenient and safe, but they enable the farmer who must use the last daylight hours in the fields, to do certain indoor work after dark, which would be impossible by the light of a lantern or kerosene lamp. The elimination of the fire hazard is also very important.

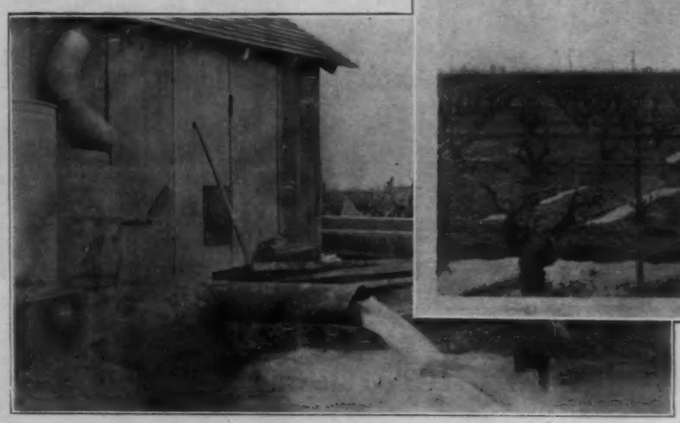


The use of a single motor to drive a number of different machines is characteristic of farm installations. In this barn the motor operates a feed cutter, and the idle belt just to the left of it goes down a pit behind the cutter where it can be connected with a pump for filling the tank on the roof, or supplying water for irrigation. Note that the barn is also lighted by electricity as it is too dark even during the daytime for work to be carried on easily and safely.

Where electric milking machines are used one person can attend to the milking of several cows simultaneously, thus saving a great deal of time on this otherwise laborious task. Milking done this way is not only quicker and easier but far more cleanly and satisfactory.

Only those who have drawn and carried bucket after bucket of water from a well for watering stock, for washing, cooking and a thousand other uses can fully realize the inconveniences of the old-fashioned farm, and the savings of an electrically-pumped water supply.

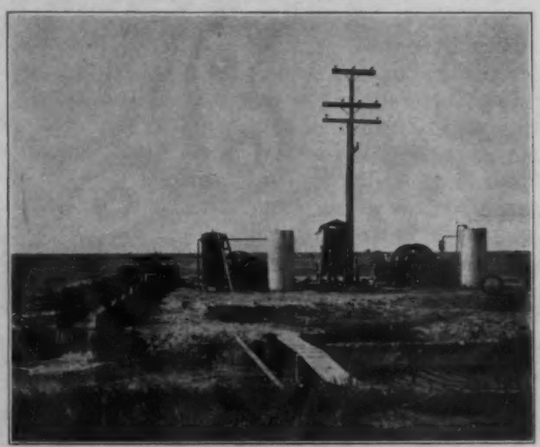
TEN MILLION ACRES OF AGRICULTURAL LAND IN THE WEST REQUIRE IRRIGATION PUMPING



Sixty-three acres of Tokay grapes saved this year by electrical pumping produced 25,000 boxes of fruit, selling for $3 to $4 a box in New York.

A 5-in. pump operated by a 5-hp. motor and having a lift of about 8 ft., irrigates 20 acres on this farm. The motor replaced a gasoline engine and proved cheaper and more reliable. Rent for a similar stream of water would be $12.00 per hour and could be secured for only one hour a week.

A row of Wickson plum trees in full bloom on a California ranch. One of the great advantages of this fruit crop is that it requires irrigation in the off-season —beginning in November and having its peak in April and May. This makes an excellent load factor, as the irrigation of other crops does not usually begin until June or July. The diversity of crops and of climatic conditions in the district of any one company and the growing tendency toward winter irrigation are factors which help to neutralize the seasonal character of the agricultural load. This particular orchard is in the San Joaquin Valley, a district representing a 2700-hp. pumping load.



On this ranch a 50-hp. motor replaced a 32-hp. gas engine to run an air compressor. Note the portable transformers ready at all times for service. The development of special equipment for farm service is progressing steadily in response to the growing demand for electric power in rural districts. California has more motor installations per acre than any other state.

Rice irrigation requires from six to eight acre-feet of water during a five-months season—twice as much as other crop irrigation requirements. This industry has come to depend almost entirely upon electrical pumping.

An Emergency Steam Plant for Rice Irrigation

BY RUDOLPH VAN NORDEN

(The rice industry in California has been developed during the last few years, with the aid of electrical pumping, into one of the largest and most important agricultural enterprises in the West. The following article tells of special measures taken during a power shortage to continue the necessary irrigation. The second part of the article will appear in the next issue. The author is a consulting engineer of San Francisco.—The Editor.)

Famed as it has become throughout the world for its varied agricultural abundance, California, less than a decade ago, was unknown as a land for rice production. Formerly, the cultivation of rice was thought of as possible only for tropical, or semi-tropical countries where there was a hot and humid climate and above all, a superabundant supply of water. In the great central valley of California, semi-arid in its natural state, irrigation was largely accomplished by means of the diversion of water from mountain streams, where the flow throughout the summer is limited. This use entailed the construction of gravity flow transportation systems of great cost and limited capacity and divergence.

Large Supply of Water Necessary

Rice requires 6 to 8 acre-feet of water per season, covering a period of five months. This amount is twice as great as other crop irrigation requirements. Solid blocks, tens of thousands of acres in extent, are intensively cultivated, and the gross quantity of water, and consequently the tremendous size and extent of the canals required to convey it, greatly exceed the possibilities of the older mountain systems. To make the demand for water even more exacting, the supply, unlike that for other crops, must be continuous. So necessary is this that, should the water fail for two, or at most three days, during the growing period, thereby allowing the land to drain, the crop would "burn up" under the intense summer heat and the season's harvest would be lost.

Growth of Rice Area in California

It was about eight years ago that the first experiments were made, near Sacramento, in growing rice on the flat alluvial lands on the west side of the Sacramento river. These lands, in many cases, were unsuited for other crops, because of the alkali content in the soil, and were therefore uncultivated. The early experiment has resulted in so phenomenal an increase in rice farming that during the season of 1920 there were more than 200,000 acres devoted to this crop, extending over an area whose dimensions from north to south are one hundred miles, and from east to west ten to twenty miles, on both sides of the river.

Low Water Supply and Power Shortage

The Sacramento is the only river source from which sufficient water to irrigate this vast area is procurable. Its low summer flow will average 5,000 sec.-ft., but the variation between years of maximum and minimum runoff is considerable. During the past summer the flow reached the unprecedented low value of about 3,300 sec.-ft. The year 1920 has been the fourth in a series of low-flow years for the rivers of central and northern California, and the low flow in the Sacramento was a result of the general low minimum flows of all the tributary streams whose sources are in the high Sierra Nevada mountains. This condition had a direct bearing upon the output of the hydroelectric generating plants located on these streams which furnish the power for pumping water from the Sacramento river for rice irrigation.

In view of the palpable shortage of power during the summer of 1919, when the power companies were put to the limit of their resources to furnish power service for pumping, and also because of a very material increase in the rice acreage proposed for the present year—much of which, in view of the probability of another dry year, the power companies refused to contract for—an acute power shortage for the season of 1920 was foreseen early in the year.

The Railroad Commission Called In

Following more or less misunderstanding between the producers and consumers of power, representatives of the former met with the Railroad Com-

mission March 1, and by concerted action placed with the Commission the right to distribute and dispose of the probable available power over the period of the summer shortage. This arrangement applied to the service for new consumers as well as to the curtailment, if necessary, of power already furnished to old consumers. News of this action was the cause of some consternation among rice growers, and following a mass meeting held at Willows on the evening of March 2, the entire delegation appeared in a body before the Railroad Commission for the purpose of cooperating with the Commission and devising ways and means for unified action, in the spirit of give and take, with a view to forestalling what promised to be endless litigation. At this time the Power Administrator of the Commission, Mr. H. G. Butler, announced that a power shortage might be expected amounting to possibly 25 per cent of the probable requirement, including new services, for the season of 1920. In the several meetings which followed committees were formed to deal with various phases of the power shortage , as well as a water shortage, which loomed before all users of water from the Sacramento river. As the result of these conferences, most of the rice growers agreed to a reduction in their power supply not to exceed 25 per cent, and it was decided that some of these growers who were putting water on their lands for the first time, but who had already expended large sums in the preparation of the land, should have some power allotted to them.

The Emergency Water Conference

The shortage which loomed as a possibility throughout the irrigation season for all users of water from the Sacramento river threatened further conflict and litigation should the supply fall short of the demand, and to forestall such actions and insure fair apportionment members of various state departments, including the Railroad and Water Commissions, and the State Engineer, together with members of the United States Department of Agriculture, Geological Survey and Board of Army Engineers, formed the Emergency Water Conference. The water users, in order to cooperate with the state control, turned over their water rights, thereby placing with the conference the apportionment, or proportionate curtailment of their diversions. Mr. Paul Bailey, of the State Water Commission, was appointed Water Master, in official charge of all diversions, a duty which he performed throughout the irrigation season.

Municipal Water Districts

Rice irrigation is necessarily handled in large blocks, the water in each instance being pumped from the river through one or more pumping stations, delivering into main canals which distribute through laterals. In most instances single landowners would be unable to finance the cost of such a system, so that in a number of cases groups of contiguous owners have formed together into state corporations known as Municipal Water Districts. These districts are created under the California law known as the "Wright Act," amended by the Legislature of 1917. Of these districts so formed, the Provident District is the second in point of extent of the rice acreage irrigated from its canals, there having been throughout the season of 1920 more than 25,000 acres so served. The river pumping plant for this district is located near Sidd's Landing, about one mile south from the old, now abandoned, town of Jacinto—the home of Frank Glenn, famous three decades ago as the "Wheat King," after whom Glenn county was named. Before the railroad running north into Oregon became an established fact Jacinto was the head of navigation for a part of the year, and was not only a wheat shipping point but a stage station at the beginning of the long overland journey into Oregon and Washington. The Sidds Landing plant contains five pumping units driven by induction motors with a combined capacity of 2,300 horsepower and delivering 550 sec.-ft. of water into the main Provident canal. This canal flows westward and then southward, branching many times, and serving a district which is twenty miles long from north to south and ten miles wide.

At a number of points it is necessary to raise the water into diversion canals and this is done through "booster plants." There are four of these boosters, requiring in the aggregate 300 horsepower. There is, in addition, another district which received most of its water from these canals through drainage. This district has a power requirement of 900 horsepower, so that the total power necessary, in terms of installed motor capacity, is 3,500 horsepower.

Meeting the Problem in the Provident District

Immediately upon the conclusion of the conferences before the Railroad Commission in which it was seen that a power shortage was probable, a meeting was called of the landowners and tenants of the Provident District. The situation was briefly outlined and the river growers were told that to secure their full water quota and their crop it would be necessary to build a steam generating plant of sufficient capacity to make up any possible shortage which might occur in the power supply, and that funds for the construction of this plant must be immediately forthcoming in order that there should be no delay in beginning the work. The hat was then passed among the forty or more land owners and lessees present, and within ten minutes approximately $100,000 had been subscribed.

This solution of the prospective power shortage appeared attractive to those concerned. But to work it out in the time allotted and within the amount subscribed involved a new group of problems for the engineer and contractor. It was generally conceded that a plant with capacity of at least 1,000 kw.

DIARY OF AN OLD-FASHIONED FARMER'S WIFE

5:30 a.m. Skim 45 gallons of milk from last night's set.

MORE ELECTRICITY NEEDED ON THE FARM

would be necessary, and if the evaluated cost of existing modern plants be any criterion, the fund available would fall far short of the amount which might be required. But by far the most serious difficulty was the time allotment for completion. It was then nearly the middle of March. By June twentieth, in all probability, the power company would have begun drawing water from storage to operate its generating plants, and shortly afterward the shortage of power would become acute. This gave little more than three months to make designs, obtain boilers, turbo-generator and machinery, transport them to the power site, erect the plant and place it in operation.

Arrangements for the building of the plant were in the hands of Mr. P. B. Cross, one of the largest landowners, who in turn placed the design and supervision in charge of the writer, with instructions to build the plant and get it operating within the time limit, and with the amount of available funds. A contract for its construction was entered into with Leonard F. Youdall, of Stockton, the builder of the Sidd's Landing pumping plant and other similar plants. The plant was built and placed in operation practically within the time and cost limits, and the results were obtained for which the installation was intended.

ELECTRICITY ON CALIFORNIA FARMS

BY L. J. FLETCHER

(The large part played by electricity in Western farming is emphasized by the fact that the state university in California includes in its regular agricultural curriculum the installation and operation and maintenance of electrical machinery. The following account is by the head of the Division of Agricultural Engineering, University of California.—The Editor.)

Power farming is the rule in California. The farmers in this state use over 33,500 electric motors, which total above 302,000 horsepower. Over 80 per cent of these motors are used for the operation of pumps for irrigation. The ranchers do not make occasional, but almost constant use of their motors; records of 2400 hours per year are not uncommon, and in the rice districts continuous runs of 1400 hours are not infrequent.

The electric motor is an ideal power for operating the centrifugal pump. Owing to its high speed it may be direct connected; it requires remarkably little attention for the services rendered, and may be operated by comparatively unskilled labor. This last is a considerable factor, since the success or failure of the gas engine or tractor depends to a very large degree upon the operator. The fact that there are but two parts of the motor to lubricate, and that these parts require attention but a few times each season, make it an almost "fool proof" machine.

While the greater horsepower is used in the operation of pumps, threshing machines, grinders, etc., the greatest benefit is derived from the use of electricity in the farm home. Here it is used to save time and labor of the usually overworked farmer's wife. It is one of the largest factors in making farm life more enjoyable. Aside from lighting the farm home, electricity is used to operate the washing machine, vacuum cleaner, cream separator, sewing machine, and now small refrigeration plants are made from a small electric motor.

Lighting of the farm house is one of the biggest advantages of the use of electricity in the country. There is practically no fire risk if the wiring is properly done. This is especially true of the low voltage systems which are used where services from the central stations cannot be secured. This lighting is quiet, convenient, cool in the summer time, and sanitary.

New uses are continually being found for electricity, one of these being the lighting of poultry houses. One of the main reasons why egg production falls off during the winter months is due to the comparatively few daylight hours. Egg production has been materially increased by lighting the poultry house a few hours early in the morning and in the evening. The fowls eat more food and produce more eggs. The rancher has an opportunity for exercising his ingenuity in solving many of the problems arising with the use of electricity. One poultryman discovered that when the lights were suddenly turned off in the poultry house in the evening the chickens could not find their way to the "bed room" and were forced to spend the night in the "dining room." The use of a resistance rheostat, which causes the lamps to become dimmer at frequent intervals, so imitated the twilight hours that the chickens stopped their activities and found their way to the roosts before the house was completely darkened.

There are two main sources of electricity for the rancher, the central station and the independent plant. The majority of the central stations distribute electricity from large hydroelectric plants located in the mountains. There is just so much oil and coal in the country, but the power of the running water is renewed annually. The rancher in this state is exceedingly fortunate to be able to look towards the use of this energy, which may truly be said to be inexhaustible. But a very small per cent of the available water power is as yet developed. Undoubtedly the uses of electricity will multiply rapidly as more of it becomes available.

Students in the Agricultural College of the University of California may enroll in a number of courses offered by the Agricultural Engineering Division at the University Farm, Davis. These courses include the operation, care and testing of pumps and motors. Belt lacing, lining up of shafting, figuring of pulley speeds and sizes, wiring for electric lines and small motors, and the care of storage batteries is included in the various courses. For those ranchers who operate independent plants a knowledge of the operation and repair of gas engines is important, and a complete course is given in this subject.

To gain the largest benefits from electricity, the rancher should know how to install and repair the various electrical appliances which he uses. The California farmer's problems are rapidly becoming those of selecting, operating or repairing his mechanical equipment. The University realizes and is providing means of education along these lines.

The Woman on the Farm

(The farm-lighting set has proved to be a good pioneer in taking electricity to the farmer before the power company is able to run its lines into a sparsely populated rural district. In the following article the point is brought out that the service of these sets is especially essential to the women on the many farms still awaiting power company supply.—The Editor.)

"Twenty miles from the nearest railway station." To the city dweller such an address conveys perhaps an idea of unattractive isolation from community amusements and companionships, but the full extent of the real "inconveniences" is not always realized. To be twenty miles from the nearest railway station involves a good deal more than a long drive over bad country roads to a little country station to get into any kind of communication with the outside world. It means no water supply such as the city dweller has come to look upon as an essential commonplace. It means usually no lighting system, no gas supply, no electric power. There are at present in this country about 9,000,000 farms outside the limits of districts served by power companies, and of these only 300,000 have farm lighting and power sets as a substitute.

The farmer's wife can prepare the dinner while the electric washing machine does the washing. For a woman who has more actual duties than can be accomplished in a normal working day this possibility of doing two things at once is invaluable.

The Power-Light Set for Farms

In spite of the rapid entry of the power companies into the rural districts, there are still multitudinous obstacles to running lines into the many areas where there are only isolated farms. The isolated plant is the immediate solution of the difficulties of the isolated farm, and the growing realization that electric power for the farm is not a luxury but a necessity is steadily increasing the sale of farm lighting and power sets. An interesting point was brought out during the war, when the farm lighting and power set was originally classified among non-essential products. A large manufacturer of these sets sent out questionnaires to the users, and the replies were so convincing that the plants thereafter were officially pronounced "essential," and their manufacture an essential industry.

Luxury and Necessity

It may be contended that electricity is still a luxury in a great many respects, and therefore no more an absolute essential on the farm than in the city home. A glance at the different conditions in rural and city districts is all that is necessary to refute the claim, and in this connection the housewife's point of view is perhaps the most illuminating. Take from the city housewife her electric supply and she is of course immeasurably inconvenienced, but life is still comparatively modern and normal. Turn to the conditions with which women on thousands of isolated farms have to contend, and you find first that there is no such thing as a faucet in the house. Every gallon of water for dish washing, house-cleaning, laundry work, cooking, drinking, bathing, has to be pumped from a well and carried in bucket or pitcher to the place where it is needed. There is no such thing as a gas range to which you touch a convenient match when water must be heated in kettle or cauldron. Hot water on the old-fashioned farm means lighting a fire in an old-fashioned stove—and cleaning up afterwards. Picture not being able to get a glass of hot milk or a cup of tea without lighting a fire. A city water supply and a city gas supply alone, with all the varied conveniences they imply, can make the domestic routine of the city housewife humanly workable. But neither of these is available to the woman on the farm, and her need of electricity is for this very reason so much the more imperative.

With an electric iron the farmer's wife can do the ironing in the coolest part of the house, instead of having to walk to and from a hot stove all the afternoon.

DIARY OF AN OLD-FASHIONED FARMER'S WIFE

5:45 a.m. Cook breakfast for 16 farm hands on wood stove.

MORE ELECTRICITY NEEDED ON THE FARM

The Manual Labor of the Farmer's Wife

Electric power is primarily a substitute for manual labor, and in this field again the farm housewife has a prior claim over the city housewife. The city woman has laundries within reach; the woman on the farm does her own washing—and a wash, usually, of a size and difficulty that would appal the average wife whose husband works in an office and whose children ride to school in a street car. Where the city housekeeper runs a carpet sweeper over the floor to take up the crumbs, the woman on the farm has to scrub. Where the city housekeeper cooks dinner for four and prepares a cold lunch for one, the woman on the farm often has to furnish three square meals a day for five or six hungry farm hands and as many children—and wash the dishes afterwards.

Moreover, the daily round of the woman on the farm does not end with the ordinary domestic duties. Often she milks the cows, feeds the chickens, makes the bread, skims the milk, churns the butter, and does endless other things that not only take time but are hard physical labor. In short, she has more than a normal working day, both in length and difficulty. She, more than any woman, needs the assistance of labor-saving devices. Domestic help is as scarce as other kinds of labor, and the round of duties which falls to the share of the average unaided housewife on the isolated farm has come to be beyond reason.

Of every 100 women on farms, 36 of them help with the milking, while 79 of them trim and fill kerosene lamps and all but four do the family washing. The women feed the poultry on the farm and usually the corn is shelled each day as they feed it.

Shortening the Working Hours

Besides the great saving in actual physical effort which the use of electricity entails, there is a special advantage for the farmer's wife in that it allows her to do several things at the same time. While the electric washing machine attends to the laundry work, she can put away the dishes—washed in the electric dish-washer—and prepare the dinner; she can feed the chickens and put the baby to bed while the electric separator skims yesterday's milk; she can mend clothes while the electrically-driven churn makes the butter. By electric lights she is saved the filling and trimming of oil lamps, and the extra washing made by the smoke; by an electric iron she is saved the long hot hours of carrying heavy stove-heated irons backwards and forwards from board to stove—and so on through an almost endless list, with time saved, strength saved, and discouragement averted.

The Farmer's Labor Problems

With the higher standard of living, the spread of new ideas, and the rapidly increasing comforts of the city, it becomes more and more impossible to maintain successfully the old conditions of labor on the farm. This applies to the regular farm work as well as to domestic work. Actual instances are recorded of a farmer being unable to engage help because there was no running water and no bath in the farm house. The continuous water supply obtainable from a motor-operated automatic water system will alone save the farmer and his wife enough in time, trouble and actual dollars to justify the installation of a power-light set.

Numerous devices for the application of electricity to all kinds of farm work have already been developed, and many more are likely to follow. Besides the more elaborate applications the farmer can saw wood and run his grindstone, his corn sheller and his feed chopper all by electricity. With the scarcity and high prices of farm labor the reduction of the time spent on chores is no small item. An elaborate chart kept by the owner of a farm in great detail for one month showed an actual saving of $104 during that period through the use of electricity for lighting, water supply, dairy work and housework. One hundred and four dollars every month for twelve months adds appreciably to the year's savings, to say nothing of all the other aspects involved.

More Light on the Farm

Next to a water system, good lighting is perhaps the greatest saving and benefit to the farmer. With electric lights in the farm buildings it is possible to do work after dark which would be absolutely impossible by the light of a kerosene lamp. It is often essential for the farmer to use the last possible hour of daylight in the fields. From the point of view of safety it is hardly necessary to point out the savings of electricity when one considers the difficulties and dangers of perambulating around a farm by lantern light, falling over a scythe, or setting fire to the barn. In large poultry farms electric illumination has been found invaluable not only in increasing the laying capacity of the hens, but in providing a safeguard against thieves. A lighting system operated from the house quickly discourages the night marauder.

The need for making the farm more attractive is imperative. The outcry against the exodus from the rural districts, the congestion in the cities, and the insufficient labor on the land is not without foundation, but part of the solution is perhaps not so complex as some have thought.

The Eighteen-Hour Day

It is the woman on the farm, however, who has the most urgent immediate need of electric power. The electrical home campaigns in the cities only serve to intensify the contrast between her lot and that of her already normally comfortable city sister. With the development of the power-lighting set for the farm there is no longer any need to wait for the arrival of the power company, even if this is to be delayed only for a year. The wiring for the farm is adapted to the service of the latter. Primitive conditions in agricultural districts are no longer unavoidable, and it is time to shorten the eighteen-hour day of the woman on the farm.

Electric Operation for Fresno Raisin Packing Plant

(As mentioned in the article below, practically all the raisins in the United States are grown in California. This means an enormous industry which must be carried on electrically. This description of the largest raisin treating and packing plant in California shows the important part electrical power plays in this industry.—The Editor.)

With the exception of very limited quantities produced in Utah, Arizona and New Mexico, all the raisins grown in the United States are produced in California. Of these Fresno county is responsible for 77 per cent. An estimate by the California Associated Raisin Company shows that in 1918 Fresno county produced 129,500 tons of raisins for which some $14,250,000 was received by the growers.

The main portion of these raisins are handled by the California Associated Raisin Company itself through its $3,000,000 seeding and packing plant, the second unit of which has recently been completed. This plant is entirely operated by electricity, constituting one of the largest consumers of the San Joaquin Light & Power Corporation. The Association has a membership of 8,000 growers and handles more than 90 per cent of the raisins grown in this region. For a time the seeding and packing was cared for through commercial companies but in 1918 the Association took over this end of the business and now owns and operates thirty-two modern packing plants and warehouses, the largest of which is that which is just completed in the southern section of the city of Fresno. The site of this mammoth packing plant covers 20 acres of ground and here from six to seven hundred tons of raisins a day are handled during the busy season.

The new Sun-Maid City Plant which has recently been completed in Fresno, California. 210 motors with a total capacity of 3500 hp. are used to carry on the many processes of treating and packing.

The Packing Process —

The packing process in brief consists of first dry heating the raisins from 3 to 4 hours, which makes it possible to readily remove the stem, stemming them, reheating them in the presence of steam, seeding them and then packing the finished product in cartons ready for shipment. All this is handled by electricity except the actual packing process—and a machine has now been devised which cares for this and which within a short time will be brought to a state of sufficient perfection so that it can take over this portion of the work.

As handled at present, the raisins are received in sweat boxes in loose form, partially stemmed. They are loaded by hand on to a belt conveyor, from which point they do not need to be rehandled until ready for the cartons. The conveyor and elevator takes them to an upper floor of the new building where they enter the drier. A battery of ten driers has been erected through which the raisins pass, subjected to a heat of 140 deg. F. from 3 to 5 hours. These driers consist of a series of great trays or "drapers" in constant motion. The raisins drop from one to the other of them to the last tray, where they are again cooled. This loosens the stems and renders them brittle, so that in the stemmer, which is the next machine they enter, the stems readily drop off. A belt conveyor transfers them from the drier to this apparatus, where they are subjected to a screw-like motion. From here they go to the grader, a series of trays with holes of graded sizes kept in constant agitation, so that the raisins drop from one to the other.

Before the use of these driers a tray system was used, by which the trays were simply inserted and baked for a given period. The present electrically operated method saves from four to five hours in time and the services of from 10 to 15 men.

Belt conveyors and elevators again take the fruit from here to the upper story, where they are transferred to the other building. A so-called "elephant's trunk" which swings constantly from side to side of an elongated hopper ingeniously secures the even distribution of the raisins on the conveyor. From here they are transported by means of a bridge to the adjoining building where they are seeded and packed.

Magnetic Pulleys for Extracting Refuse —

There is always danger of nails or other iron refuse being included among the fruit which would endanger the machinery of the seeders, as well as prove objectionable if not caught—and a system of magnetic pulleys has been devised by which practically all metal is extracted as the raisins pass between the two buildings. The current as supplied to the factory is, of course, a.c., but a simple d.c.

DIARY OF AN OLD-FASHIONED FARMER'S WIFE

6:00 a.m. Wash 162 dishes with water heated in tea kettle.

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generator supplies the necessary current for these magnets, as well as for those used between the "processor" and the seeding machinery.

In the second building the raisins are now distributed between a battery of eight "processors." These are great revolving containers in which the raisins are treated by steam, softening them after the drying process and putting them in good shape for passing through the seeders. Before passing through the seeder, the raisins again pass over magnets which remove any metallic material which may have escaped the magnetic pully of the belt conveyor.

The Seeding Process —

The seeder consists of rubber rollers which flatten the raisin and bring the seeds to the surface, and a saw roller which extracts the seeds without greatly injuring the texture of the raisin. The seeds

An electrically operated packing machine has been devised to fold, line, pack, weigh, refold and seal the cartons, thus relieving the many workers shown in this picture for other work.

The raisins are seeded in the machines shown above. Here rubber rollers flatten the raisin and bring the seeds to the surface where a saw roller extracts the seeds without injuring the raisin.

are removed from the teeth of the saws by a whisking device and are then sent along to a seed receptacle. From here they are removed by conveyor to the California Products Company which has an adjoining factory. A grape syrup and a grape seed oil similar to cottonseed oil is made from the seeds which find a ready market. Even the refuse remaining after this process is utilized by being baked into bricks used for fuel in industrial and even home furnaces.

The raisins themselves drop from the seeder direct to a hopper whence they drop to the floor below where packing operations are carried on. An ingenious system of vanes which can be shifted from side to side, permits the amount which is sent from any one machine to a particular table to be regulated, so that the output may be evenly distributed between the various tables. Each machine discharges to about four of these packing tables.

The present practice in packing involves the services of several young women in folding cartons, lining, packing, weighing, refolding and sealing. A machine for accomplishing all these steps has been worked out and is established at the present time on the mezzanine portion of this floor, where it has already demonstrated that it can do the work. One or two mechanical improvements are contemplated, but it is expected that shortly the entire process from sweat box to freight car will be accomplished by electricity without the raisins being touched by human hands.

From the packing tables the cartons are transferred in boxes by belt conveyors to the floor below, where they are nailed up and again conveyed to the waiting freight cars. The seedless raisins in the meantime have been going through a similar process (except of course that they need not be seeded) at the other end of the building, and pass through the packing department in similar quantities. About 350 tons of each are handled daily during the months of October, November and December.

Auxiliary Electrical Operations —

Aside from the main details of the raisin packing, various other needs of the factory are also electrically operated. The saws used to make up the toothed roller are continually wearing out and losing teeth and a machine for replenishing these saws is kept in operation on the same floor. These are made by the simple process of stamping out the disks of metal and then punching them with teeth with a specially constructed machine. The rotary disks are then strung along an axle, giving the effect of a long cylinder of irregular indentations.

There are 620 motors on the system, ranging in size from ½ to 100 hp. Current used is a.c., 60 cycles, at three voltages—110, 220 and 440-v. These motors are divided between the 32 plants of the California Raisin Association, 210 of them being used in the Fresno Sun-Maid City Plant. The total capacity of all motors is 3500 hp., the commonest sizes in use being the 1/20-hp., 3, 5, 7½, 10 and 15-hp. motors. The 1/30 and 1/20-hp. motors are used on the automatic weighing machines for filling small cartons with raisins in the seedless department.

Handling the Load —

In the Fresno plant 1000-kw. transformer capacity is provided for stepping down the current which is delivered at 10,000 volts to 440 volts for use in the factory. The connected load is 1232 hp., the maximum demand from the period from October to November, 1919, being 453.3 kw. The consumption for the same period was 146,800 kw-hr. In addition a 100-kw. transformer capacity is provided for

lights, which during the winter months average about 94 kw. A complete intercommunicating telephone system connects all floors of both buildings and all departments. Direct current is used only for the magnetic pulleys on the conveyor belts, employed for removing iron from the raisins before they enter the seeder, and for this purpose a small generating set is provided. The average load factor of the plant is about 75 per cent.

Steam is used for heating the driers and in the "processing," but not as motive power in any portion of the establishment.

Service to Employes —

Medical and dental service is provided for all employes through a welfare organization, supported in equal amounts by the employes and the management. Traveling nurses attend the workers in their homes, and special equipment is on hand in the plants for dental or surgical cases. Electricity is used here in the usual applications of a doctor's or dentist's office.

A chemical department which provides assistance to farmers wishing soil analyses and also experiments in by-products from the raisin is part of the regular staff of the plant. Such progress is being made in the development of by-products, that the company plans to take over this part of the business shortly and handle its own raisin seeds.

Electrically operated belt conveyors transfer the cartons from the packing tables to the floor below where they are nailed up and again conveyed to the waiting freight cars.

The Basic Industry

BY A. EMORY WISHON

(Public support of electrical development can be won only by proving to the public that its interests are bound up in this development. In the following paper, which was delivered before the Pacific Division, Electrical Supply Jobbers' Association, at Del Monte, October 23, the assistant general manager of the San Joaquin Light & Power Corporation tells the fundamental story of electricity in its relation to industrial and civic development.—The Editor.)

The development of the Pacific Coast depends entirely upon electrical development. It may be argued that the future of the electrical industry on the Pacific Coast is uncertain, as we face a great financial and a great labor problem. It is true that from the greatest financier to the ex-bartender this problem is being considered, but for once a common answer seems to prevail—constructive conservation and more production. But who is to conserve, and who is to produce more? Capital "passes the buck" to Labor, and Labor "passes the buck" to Capital.

The large banking houses have begun to withdraw credit from industries not essential, and are extending credit to industries that increase the production of essentials. It is a problem of mutual interest to Capital and Labor—and only by mutual action can disaster be averted.

Constructive conservation is the answer—more production on the part of every industry, business and individual. Quit "passing the buck." Do your part, no matter how small it may be, and encourage others to conserve constructively and produce more.

The public as a whole is talking constructive conservation and more production. Is there any industry in the world today that stands ready to do more in the production of essentials and in the conservation of labor, fuels and materials, than the electrical industry?

We who have studied the problems of the development of the West know that the West will not develop ahead of its hydroelectric development. The greater portion of Western territory depends upon hydroelectric development for irrigation of its arid land if agriculture is to be further extended, and increase of agricultural production made possible. If factories are to be built in the West, cheap power must be obtainable in order to conserve fuel and labor.

How the Income Is Distributed

If work is to be added for the laboring man, development must continue. I will cite the instance where a delay on the part of a power company due to its inability to serve 600 new agricultural applicants in Fresno county caused a study to be made as to the effect of this delayed development on local industry, and the effect of electrical development on labor and local industry. In Fresno county in 1910 there were 16,799 homes. There were 6,245 farms, or approximately two homes in town for every home in the country. It was therefore apparent that when electrical service was rendered and the 600 new farm homes constructed, 1200 new town homes would be constructed, or 1800 additional homes would be built,

DIARY OF AN OLD-FASHIONED FARMER'S WIFE

7:30 a.m. Sweep and dust for 2 hrs., potatoes boiling dry in the meantime.

MORE ELECTRICITY NEEDED ON THE FARM

directly due to electrical development; and this does not include commercial buildings, factories or other construction made necessary to handle the products of the 600 farms, and to supply the trade which is made possible through this agricultural development.

The cost of the average town home in this locality, including building site, is $6000, and of the country home without building site, $5,070, or a total building construction program of $10,242,000. A study was then made of the materials and labor that went into the average home, and it was shown by curves that were indisputable that the carpenter trade would receive 15.5% of this delayed building program of $10,242,000; that the lumberman would receive 14% of this $10,242,000, and that the plumber would receive 3.85% of this amount—and so on through the lists of material and trades necessary in the construction of the average home. This is an example of what the electrical industry can do in increasing production and creating pay-rolls.

Economies and Production

Now as an example of what can be done in conservation—today the company I represent furnishes current to nearly 3000 oil wells. The average well uses approximately 100 kw-hr. daily, yet if this well were operated with an individual steam plant the average daily use of oil would be in excess of two barrels per well operated. Practically all the power that goes to supply these wells is hydro, and consequently these full two barrels of oil per well are conserved. Or, estimating 2500 wells operated, a conservation of 5000 barrels per day or 1,825,000 barrels per year. Even estimating that the wells were operated by utilities using steam for fuel, the average number of kilowatt-hours produced per barrel of oil by power companies of the state, I believe, will be approximately 200 kw-hr. Or, if these same wells were served with utility steam-produced power, a saving of 75 per cent on the fuel would still be possible. I cite this example for the reason that when you can pump oil from the ground with electricity at such a saving, it leaves no argument on the saving that can be made after this oil has been transported to points distant from the field.

More production—greater conservation, is what the nation is clamoring for. If we can put the idea over with the public, of what the electrical industry stands to do in relieving the present tense economic situation, then I ask you if the electrical industry should not have the brightest future of any industry in the nation today; and should it not receive the political, individual and moral support of the people as a whole?

The Self-Interest Appeal

But the public does not understand the electrical language, and it must be driven home to them in terms of self-interest, by proving to the individual of that public what the electrical industry is doing for him—what the electrical industry means to him in dollars and cents, and what lack of electrical development means to him in loss to his individual business. Prove your case to the individual by proving where that individual's pocketbook is hurt when your business is hurt, and you will have a convert who will see that your business shall prosper. It is no new theory. It is as old as man. Self-interest is that element that causes strife, greed, war, ambition, strikes, profiteering, and even enters into love. It is largely responsible for the present unsettled condition; yet it can be capitalized to the benefit of the electrical industry and for humanity. It is the solution of the present national condition.

To put the story across with the people in order that we may perform this great service in the solution of the present national problem, and that we may prosper in our business, may seem a great undertaking.

There was a time when the waters of the seas offered an impregnable barrier. Boats were unknown. But the very fact that those seas were a great part of the universe meant that they must be capitalized into bearers of burdens; into lanes of transportation—and they were.

Fire in its volcanic origin, or through lightning, meant only death and destruction to the natives. Today we have capitalized that destructive element into probably the greatest worker for and comforter of mankind. Even in the frozen Arctic the ice that would kill by freezing is turned into homes to protect from the cold.

Selfishness, self-interest is a great constituent part of humanity. It cannot be denied or eliminated. Since the beginning it has been evident in every man every day. Creeds or philosophy have not killed it—though in some instances they have eliminated one line of self-interest by instilling a new thought that offers a greater self-interest. The Golden Rule, probably the only passage in the Bible that is left entirely to individual interpretation today, is simply a rule of right and wrong, based upon self-interest.

To Let the People Know

We as an electrical industry are the foundation upon which all future development of the West must be built. To continue, we must finance. To finance we must have a protected investment, and a fair rate of return. To make this possible the people must understand this story. And that the people may be made to understand, the story must be told so that the individual interest is appealed to; and that individual interest can only be secured by proving to the individual what electrical industry and development means to him in dollars and cents; in better standards of living, in more production and greater conservation. His self-interest must be developed.

It is a big undertaking, but it can be done when every man in the electrical industry knows the story; sells the idea to his wife and to his mother-in-law—which will probably be a real test of his ability to sell the idea to the public. It is basically a truthful, simple story; one that will be listened to with interest by civic organizations, by individuals, and by children in the school. When the electrical industry qualifies in putting this story across to the public, then there will be no doubt of the future of the electrical industry.

The pioneers have controlled the waters of the Sierras, moulded dams and brought the electrical industry to the point where it is today. It is up to us of the electrical industry today to control and mould the public opinion upon which the future of the electrical industry depends.

FINANCING PUBLIC UTILITIES IN THE WEST

BY A. N. KEMP

(A timely paper on the subject of Junior Financing is this article by the comptroller of the Southern Edison Company. It points the way to new methods of securing public good-will in financing the vast basic industry for the industrial development of the West and adds to our present day knowledge a treatment of the subject by an authority that will have great weight throughout the West.—The Editor.)

In the East, for instance, industry has grown up where coal, oil, or gas is most available, and now that the diminution of these is in sight, industry is energetically looking for another source, namely the "white coal" which we have. The three Pacific Coast states have forty-four per cent of the undeveloped power, and have heretofore been leaders in development of electricity, consequently they look for large industrial growth. The climate also is becoming a real industrial asset.

Programs have been adopted by the utilities to develop large amounts of hydroelectric power at an estimated expenditure in California alone of $50,000,000 a year. How is this money to be raised?

Financing Development at Home

Before the war, Europe, being fully grown, had a surplus of created wealth which was available for investment in other parts of the world, and industries of this country were able to look to Europe for funds. During the war this condition changed, and now we cannot look to Europe; but just as the United States formerly looked to Europe, now California looks to the East.

The East we use for marketing of our senior financing, consisting of bonds, which should provide from two-thirds to three-quarters of the money, the bonds being sold through Eastern bankers. Now, as to stock, inasmuch as this development is for our own benefit, we should selfishly and patriotically handle the stock at home, so as to retain active management and direction of our development. As there is a large demand for funds, in competition with others we must offer an attractive security.

Development of our utilities is much bigger than any man or group of men, than any utility or group of utilities, and requires and needs the support and help of all the people. The Railroad Commission has studied this situation, has awakened to it, and realizing the responsibility which goes with its authority, will help utility development. President Edgerton has shown a very active interest and has promulgated some new ideas in public utility affairs which should be of great assistance.

A Financial Reserve

One of these is the Financial Reserve. He says that a utility should have some means of insuring the payment of its interest and dividends without constant fluctuation in rates. Electric utilities have fluctuating operating expenses due to dry or wet years, and the establishment of a reserve out of which funds can be drawn to make up shortages in dry years is a necessity. In other words, when operating expenses are high and use up part of the gross, this reserve will be drawn on to make up the difference so as to insure the continued payment of interest and dividends. This would be an element of strength in stabilizing the value of public utility securities.

Distributing Rewards for Efficiency

Another plan is what is known as the Reward for Efficiency which, briefly, is that the utility surplus remaining after paying out of its gross revenues operating expenses, depreciation, reserves, interest, dividends, etc., should be used to provide 50% to the public, 25% to the stockholders, and 25% to employes. The public is entitled to a share because it has been instrumental in building up the business to this resulting improved operating ratio. Employes are entitled to a share as an inducement to improve further still their personal efficiency. The company through its stockholders is entitled to a share by virtue of the condition of its credit and its operations as a corporation.

The Electrical Industry a Public Servant

It is an incontestable fact that the development of our country depends on the development of the utility, and they can only grow together. Development work is in this sense, therefore, a patriotic one in which the public is perhaps more concerned than the utility itself. In other words, the electrical industry is a public servant and must develop in line with the public's wishes; in return it should receive a just reward.

IRRIGATION IN MONTANA

Although the Montana Irrigation Commission has been in existence less than ten months, a survey of the work accomplished is most gratifying. The principal work has been the examination of proposed districts. The petitions now before the Commission embrace a total of 168,700 acres. The largest single district considered is the 90,000-acre project in the Judith Basin, Fergus county, estimated to cost over two million dollars.

There are now thirteen projects within the state which have elected to come under the new irrigation law and have filed their petitions with the Montana Irrigation Commission, while several others are being formed with a view of coming in this summer and fall. In Broadwater county, near Three Forks, is a proposed project of 3,000 acres which will be irrigated by pumping water by electric power.

DIARY OF AN OLD-FASHIONED FARMER'S WIFE

9:45 a.m. Spank the baby for playing with coal oil lamp.

MORE ELECTRICITY NEEDED ON THE FARM

R. W. Clark, assistant sales manager of the Puget Sound Power and Light Co., Seattle, whose effective work as chairman of the advisory committee is in large part responsible for the enthusiasm with which the new movement is being inaugurated.

J. V. Strange, assistant general manager of the Pacific Power and Light Company, Portland, Ore. Mr. Strange has been one of the strongest members of the committee in laying the plans for a successfol Northwest Electric Service League.

Roy C. Kenney, manager of the Portland office of NePage-McKenny and president of the Oregon Contractors and Dealers' Association, which has already pledged its support to the new cooperative movement.

A. C. McMicken, sales manager of the Portland Railway Light and Power Company, who presided over the important meeting of the Northwest Light and Power Association at which plans for the new movement were definitely adopted.

PROGRESS OF THE NORTHWEST ELECTRIC SERVICE LEAGUE

Unquestionably one of the most important events in the electrical industry of the Northwest is the inauguration of the cooperative movement now under way in that district. The preliminary work toward the realization of the plans recently adopted by the Northwest Electric Light and Power Association has already been undertaken. Joint meetings have been held in Portland at which the possibilities of the movement were discussed and the ground prepared for its actual initiation.

A significant aspect of the situation is the unanimous support given this work by the contractors and dealers throughout the Northwest. So much interest was felt in the possibilities of the movement that a delegation from Washington and Oregon attended the Pasadena Convention of last May expressly for the purpose of getting in touch with the California Electrical Cooperative Campaign and of learning from its experiences. The Portland dealers have already expressed their approval of the Service League in the most concrete way by pledging their quota toward its financial support.

The work to date has been in the hands of the Advisory Committee especially appointed by the executive committee of the Northwest Electric Light and Power Association to report on the feasibility of the cooperative movement in the Northwest. To R. W. Clark, as chairman of that committee, must be given the credit for much of the constructive work which has already been done. The other members of the committee, many of whom are pictured on this page, are:

F. N. Averill, Fobes Supply Company, Portland, Oregon
L. A. Lewis, Washington Water Power Company, Spokane, Wash.
W. R. Putnam, Idaho Power Company, Boise, Idaho
R. F. Bailey, Utah Power and Light Co., Salt Lake City, Utah
J. Ryan Gaul, The Montana Power Company, Butte, Montana
J. F. NePage, NePage-McKenny, Seattle, Wash.
W. M. Meacham, Meacham and Babcock, Seattle, Wash.
J. I. Colwell, Western Electric Company, Seattle, Wash.
J. R. Tomlinson, Pierce-Tomlinson Electric Company, Portland, Oregon
Roy C. Kenney, NePage-McKenny Company, Portland, Oregon
A. C. McMicken, Portland Railway Light and Power Co., Portland, Oregon
J. V. Strange, Pacific Power and Light Company, Portland, Oregon
C. B. Hawley, Intermountain Electric Company, Salt Lake City, Utah
H. L. Bargion, Montana Electric Company, Butte, Montana
W. D. McDonald, Westinghouse Electric & Mfg. Company, Seattle, Wash.
R. T. Stafford, Allis-Chalmers Company, Seattle, Wash.
A. S. Moody, General Electric Company, Portland, Oregon

C. B. Hawley, manager of the Intermountain Electric Company of Salt Lake City, brings the Utah cooperative spirit to the wider Northwest movement in which Utah hopes later to take active part.

F. N. Averill, manager of the Fobes Supply Company, Portland, Wash. The jobbers and contractor-dealers of Portland have for some time been holding joint meetings in the furthering of their common interest.

Lewis A. Lewis, sales manager of the Washington Water Power Co. of Spokane, who has done progressive work in that district in establishing cordial relations betleen all branches of the industry.

J. R. Tomlinson of the Pierce-Tomlinson Electric Company, Portland, who with Mr. Kenney has had much to do with the success of the strong contractor dealers' organization of the Portland district.

A. S. Moody, of the Portland office of the General Electric Company is always back of constructive efforts to better the electrical industry and has taken an active part in the formulation of the plans under way.

H. L. Bargion, manager of the Montana Electric Company. The electrical men of Montana have taken a vital interest in the making of plans and the state counts on entering the list of those who participate in the Service League.

J. I. Colwell, Seattle manager of the Western Electric Company. The jobbers are strongly behind the Northwest campaign in the broadest spirit of cooperation and their support is vital to the success of the movement.

W. D. McDonald of the Westinghouse Electric & Manufacturing Co., Seattle. Seattle and Portland are looked to as the centers from which the new movement will start, from here spreading throughout Oregon and Washington.

Potential Kilowatts and Business

BY JOHN M. MORRIS

(Here is a surprising story of what happens in industry when one kilowatt of hydroelectric power is developed in the West. It shows clearly the vital concern of all branches of the electrical industry in the development of water power. The author is with the Westinghouse Electric & Manufacturing Company of Los Angeles, and presented this paper before the recent meeting of the Pacific Division of the National Electric Supply Jobbers' Association at Del Monte, October 23, 1920.—The Editor.

It would be difficult to conceive of a subject of more vital interest to the whole electrical fraternity of the West—manufacturers, central stations, jobbers and dealers—than that of the relation of hydroelectric development to the resulting demand for electrical apparatus.

Let us first turn to the frontispiece of this issue of the Journal of Electricity and imagine, if you will, a quantity of water equal to about one-half the capacity of the gasoline tank on your automobile, or ten gallons, as being dropped down from the storage above to the water wheel below. You will agree that the quantity appears insignificant from the standpoint of potential power; but let it fall a distance of 600 feet, properly harness it, and a single kilowatt of electric energy has been developed.

A natural question we each might ask is, "What does it mean to me in my business to see that this potential kw. is developed—does it mean much or little, or in fact, does it mean anything to my own particular business?"

First of all, we harness our ten gallons—which means the construction of tunnels, penstocks, a power house, and of course one kw. in generator capacity and one kw. in step-up transformer capacity. It is of interest to note that it costs $140 to do this and to make 1 kw. available to the transmission line. We might note that of this $140 approximately 15 per cent, or $21, is spent for electrical apparatus, the balance going for development of power sites, etc.

It is evident that we must provide at least 1 kw. in transmission line capacity in order to bring this 1 kw. from some power house more or less remote, to the point where it is to be distributed at lower and more convenient voltages. This involves the purchase and construction of towers, the installation of insulators and step-down transformers, amounting to $70.00.

We now have a good start, having already accounted for 3 kw. in electrical apparatus. We are now ready to distribute this at lower voltages to the points where it is actually to be used.

But, in this distribution step, we must take into consideration the matter of load factor; in other words, for each kw. in generator capacity, more than one kw. in distribution capacity is necessary. We have indicated on our chart that two kw. in distribution capacity is usually installed to take care of one kw. in generating capacity.

Wire and insulators	$27.80
Poles and fixtures	21.00
Line transformers	24.28
Meters	14.20
Sub-station apparatus	17.72
Miscellaneous	35.00
	$140.00

It costs $140 in distribution capacity to take care of our 1 kw. in generator capacity, and it is of interest to note what this means in the way of apparatus, as shown in the preceding table.

We are now ready to take up the last step, namely, to consider the apparatus installed in residences, factories and farms, at the points where the electrical energy is actually used.

The ratio of apparatus installed on customers' premises to distribution capacity varies over such a large range that it is difficult to do more than assume a rough figure as representing this ratio in a general way. In the case of industrial plants, this ratio is probably in the neighborhood of 2½ to 1. In residences, this ratio would run perhaps as high as 5 to 1. We have assumed in our chart an average ratio representing all users as being 3 to 1. In other words, we may expect to see 6 kw. in apparatus of all kinds installed on a consumer's premises for every one kw. generating capacity.

On our chart we have indicated the sum of $750 as representing the cost of purchasing and installing apparatus on customers' premises to take care of 1 kw. in generating capacity.

The following table indicates in a general way how this figure of $750 was obtained:

6-kw.	Industrial Users, 3½ kw.	Conduit & wiring, including labor,	@ $35 per kw.	$122.50	
		Motors, etc.	@ $20 " "	70.00	
					$192.50
				say.	$200.00
	Residences & Lighting users 2½-kw.	Conduit & wiring, 2½ residences	@ $200 " "	$500.00	
		Lamps and appliances, 2½ residences	@ $20 " "	50.00	
					$550.00
				Total.	$750.00

It is estimated that from $50,000,000 to $70,000,000 should be invested each year for the development of electric power on the Pacific Coast.

On our chart we have assumed this figure to be $50,000,000. On this basis we reach the surprising result that this means $105,000,000 per year to the jobbers and dealers in the sale and installation of apparatus on the premises of the ultimate consumers. Here, then, is a very definite and specific reason for the electrical fraternity as a whole doing everything possible to facilitate this development.

DIARY OF AN OLD-FASHIONED FARMER'S WIFE

10:00 a.m. Scold Miranda for reading when she should be operating hand churn.

MORE ELECTRICITY NEEDED ON THE FARM

Interesting Additions to the Longest Transmission System

BY C. O. POOLE

(World records are always interesting, but the fact that east of the Sierra Nevada Mountains is the longest single transmission hydroelectric energy in the world is of unusual interest in view of the present day emphasis on the transmission of energy over ever-increasing distances. Here is an article describing some of the new additions that are now being made to this system. The author is chief engineer of the Southern Sierras Power Company, the holding company for this system of transmission of world record proportion. The photographs are by W. L. Huber.—The Editor.)

Owens River Gorge, on the eastern slope of the Sierra Nevadas, where the river falls 2200 ft. in a distance of 15 miles.

JUST over the range on the eastern slopes of the Sierra Nevada Mountains lies a country that is little known to the average Californian. In strange contrast with the western slopes of this range, the fall from the summit of the mountains to the valleys below is very precipitous. Across the floor of these valleys, a few miles distant, you ascend another range of mountains, the peaks of which reach an altitude of more than 13,000 feet. Geographically this country seems a part of Nevada rather than California, and influenced as it is by the near-by Nevada deserts, it differs very much in climatic conditions from the great valleys to the west.

The little village of Lone Pine, nestling at the base of the mountains, lies virtually in the shadow of the highest mountain peak in the United States—Mount Whitney, which is scarcely six miles distant. This steep slope of the range has been taken advantage of in the development of hydroelectric power, and the traveler will notice, stretching through the entire valley, a line of towers supporting conductors which will carry the subtle energy far into the lower elevations. Across blistering deserts and mineral-laden mountains, through the orange groves of Southern California the line goes on, touching the great Imperial Valley, and on over the mysterious sandhills of the Mexican border to the Colorado river. Here California merges into another state, but the line goes on.

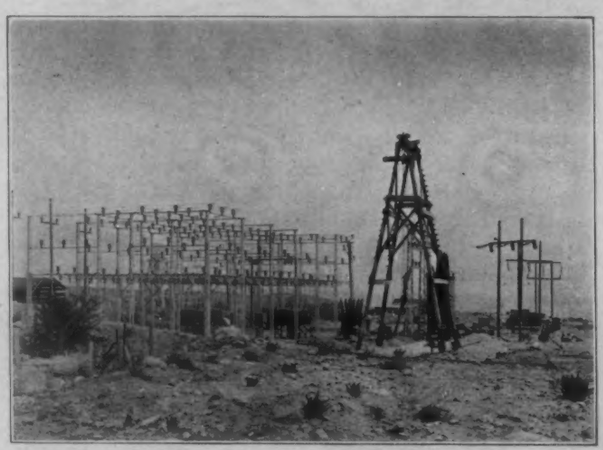
Water Sources of Southern System

The principal source of supply for the systems of the Nevada-California Power Company and the Southern Sierras Power Company is found in Inyo and Mono counties, California. The first developments of the companies were the installation of a string of five plants on Bishop Creek, utilizing a fall of 3400 feet in this stream. The growth of the business of these companies demands the bringing in of a hydro plant practically every year and, in keeping with this practice, there are at the present time two developments in course of construction, some features of which may be of general interest.

The Southern Sierras Power Company owns in fee-simple a mile of Owens river stream bed in what is known as the Owens River Gorge, located fifteen miles north of the town of Bishop. This location is on the same parallel as Merced on the western slope. The shrinking of the volcanic plateau formed a great fissure in the earth, through which the river is now flowing. The banks are six hundred feet above the stream for a distance north and south of fifteen miles, and in this distance the river falls 2200 feet. The average flow of the stream will be a little more than 300 second-feet. The mile of river owned by the Southern Sierras Power Company has a drop of 421 feet, and work is under way for the complete development of this part of the stream.

An Auxiliary Power Plant

In order to relieve, at least in a measure, the present power shortage, this company is now nearing the completion of a 2500-kw. plant on the river, utilizing 143 feet of the fall of the stream. This development was decided upon for the reason that it could be put into service in a very much shorter time than it would take to drive the long tunnel for the complete development. When the main plant is installed, the present plant (which is called the auxiliary plant) will be retained to utilize the stream flow during the heavy run-off period. This plant is designed to use 350 second-feet of water, while the river runs as high as 900 second-feet during some seasons. After the main plant is completed to utilize the 421-foot head, the auxiliary plant will be made automatic, or remote controlled from the main plant.



The Bishop Creek Control Station of the Nevada-California Power Company where is installed the largest transformer west of the Rockies,—all the power supplied to the entire system passing through it.

The auxiliary plant now being constructed gets its water from the stream by means of a concrete overflow diverting dam in the river bed, turning the water into a wooden flume twelve feet wide and sides five feet high, for a distance of 363 feet, where it connects to a large gate and screen box. From this point a flume eight feet wide by seven feet high carries the water a farther distance of 510 feet, where the flume connects with a concrete screen box that also serves for an intake for the penstock.

The penstock consists of a 66-inch diameter riveted steel pipe line 650 feet long, which terminates in the power house, connecting to a butterfly valve which controls the water entering the turbine. The turbine is a horizontal double-discharge Pelton unit direct-connected to a Westinghouse 3000-kva., 6600-volt, three-phase, 514 r.p.m. generator with direct-connected exciter.

The current generated at 5600 volts will be carried on a line down the canyon 3400 feet to a bank of transformers now being installed at the site of the main plant. This transformer bank consists of three 3500-kw. units, stepping up from 6600 volts to 88,000 volts delta, or 155,000 volts star. This bank will take care of both the main plant and the auxiliary plant.

The power house of the auxiliary plant is a solid concrete structure 32 ft. by 54 ft., of pleasing appearance, and is provided with a twenty-ton traveling crane for handling the equipment.

The main plant, when completed, will have a capacity of 7500 kw. in one unit. There will be a tunnel 4700 feet long and 10 ft. by 12 ft. in dimensions, to which will be connected a 66-inch pressure line 900 feet in length. The combined capacity of the two plants will be 10,000 kw.

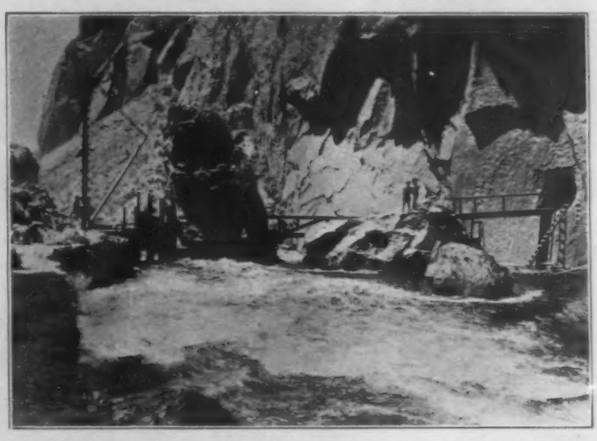
The upper end of the steel tower line before referred to terminates at Bishop Creek, at which point all the other lines in that locality converge. The switching station at this point is called the Control Station, as the plants and lines are controlled from that point. Extending north from the Control Station into Mono county a distance of sixty-four miles is a circuit of 4/0 aluminum-steel conductor supported on "H" frame wooden poles. This line is insulated for 150,000 volts and serves as an artery for the hydro plants in the Mono Basin.

A Development at High Altitude

To supplement the present plants in that locality there is under construction at the present time a 10,000-kw. plant known as the company's "Leevining Creek Number One." This plant will be fed from the snow fields of Mt. Conness and Mt. Dana. These mountains contain two of the largest glaciers in the range. An interesting feature of this development is the altitude at which the work is carried on.

The principal storage of the development is what is known as Saddlebag Lake, which is located on one of the branches of Leevining Creek at an elevation of 10,050 feet. The ultimate capacity of this reservoir will be 18,000 acre-feet. The dam is a rock-fill timber-face structure, the ultimate height of which will be fifty-seven feet above lake level. The length of the dam at the crest will be 700 feet. There is a cut into the lake which will lower the present water level 12 feet, giving 2,000 acre-feet additional storage. The drainage area back of this reservoir is not sufficient to fill it when the dam is carried to the ultimate height, therefore additional branches of the creek will be diverted into the storage basin by means of canals and tunnels. A drop of 350 feet between this reservoir and the main stream below will be utilized by the installation of a 1000-kw. automatic plant.

The water after leaving this plant will flow down the natural channel of the stream for a distance of two and one-half miles, into Rhinedollar Reservoir, a combined storage and intake pond which lies on the very edge of a precipice at an elevation of 9,600 feet. From this intake reservoir the water will be conducted through a pipe 48 inches in diameter, a distance of 600 feet, which will connect to a rock tunnel 2200 feet in length. From the tunnel the water



Diversion dam and intake for the Adams plant of the Southern Sierras Power Company

reaches the power house through a steel pipe varying in diameter from 40 inches to 32 inches, having a length of 3600 feet, giving a fall of 1670 feet in a total of 6400 feet of conduit.

The plant is designed to use 100 second-feet of water driving a single over-hung, impulse type water wheel with a generating unit of 12,500-kva. capacity, at 6600 volts. Outdoor transformers will step the voltage up to 150,000 volts, feeding into the transmission system connecting with Control Station on Bishop Creek. This is one more link in the rapidly growing system of the company.

It is certainly an inspiration, even to an engineer, to stand on Saddlebag Dam and let his thoughts follow the waters over 500 miles—from the melting snow down through its many changing forms of energy; from the turning of the water wheel near-by

DIARY OF AN OLD-FASHIONED FARMER'S WIFE

10:10 a.m. Wash one dozen sheets, not to mention other family wash.

MORE ELECTRICITY NEEDED ON THE FARM

to the transformation of the desert lands into orange groves, and turning of the muddy waters of the Colorado into crystal ice in the great Imperial Valley. Thus, ice returns to ice.

MOTORS FOR THE FARM

(The farmer will be happy enough to lighten his chores through the use of the electric motor if the electrical man will present the motor and tell him how, when and where to use it. This is a short summary of the farm machines which can be run by motors, complete equipment for the barn, dairy and residence being given.—The Editor.)

For the benefit of those who have occasion to handle motors in towns in farming communities the following table and remarks which were prepared by the Westinghouse Electric & Manufacturing Company will prove of the greatest value. The farmer whose farm is located near the transmission or distribution lines of a power company can easily be shown the applications of electricity and the subsequent savings in dollars and cents. To the farmer who is in the market for a farm lighting set this table should be shown so that he will not think that the only thing that electricity can do for him is to light his house and barn.

MACHINE	MOTOR HORSEPOWER Minimum	Maximum	Size Most Used
Feed grinders (small)	3	10	5
Feed grinders (large)	10	30	15
Ensilage cutters	10	25	15-20
Shredders and huskers	10	20	15
Threshers, 19-in. cylinder	12	18	15
Threshers, 32-in. cylinder	30	50	40
Corn shellers, single hole	¾	1½	1
Power shellers	10	15	15
Fanning mills	....	....	¼
Grain grinders	....	....	¼
Grain elevators	½	5	3
Concrete mixers	2	10	5
Groomers (vacuum system)	1	3	2
Groomers (revolving)	1	2	1
Hay hoists	3	15	5
Root cutters	1	5	2
Cord wood saws	3	10	5
Wood splitters	1	4	2
Hay balers	3	25	7½
Oat crushers	2	10	5
Cider mills	2	5	2½
Clover cutters	¼	½	½
Water pumps	½	5	3
Cream Separators	1/10	¼	⅛
Butter churns	⅛	3	¼
Milking machines	3	5	5
Bottle washers	⅛	¾	½
Vacuum system	2	3	3
Refrigeration	½	25	3-5
Grindstones	⅛	¼	¼
Emery wheels	¼	1	¼
Lathes	¼	½	½
Forge blowers	1/15	⅛	1/10
HOUSEHOLD MACHINES			
Sewing machines	1/40	1/30	1/30
Buffers and grinders	1/40	1/30	1/30
Portable vacuum cleaners	1/83	1/45	1/83
Large ice cream freezers	⅛	¼	⅛
Washing machines	⅛	2	⅛ to ¼
Centrifugal dryers	1	2	1
Mangles	¼	1	½
Meat grinders	¼	¾	¼
Sausage stuffers	½	1	½
Water pumps	¼	1	½
Meat grinders	¼	¾	¼
Sausage stuffers	½	1	½

This table includes more electrically-driven farm machinery than is found on the average farm. On a well-equipped average-sized dairying, mixed farming, and small stock raising farm, say of 100 to 150 acres, the following machinery will probably be found:

Barn Equipment (heavy duty): Corn sheller, feed grinder, fodder and ensilage cutters, hay hoist, hay press and baler, threshing machine, cider press, wood splitter, and sawing machine, all of which are heavy duty machines required at different times of the season, so that a single motor large enough to do the heaviest duty, mounted on a skid or truck, will do all the work and keep the investment at a minimum. A 10-horsepower motor with its overload capacity will perform work equivalent to a 15-horsepower gasoline engine.

Barn Equipment (light duty): Grindstones, emery wheels, bone grinders, etc. These are usually located in a repair shop and can be driven by a small motor connected to a shaft. Water pump, spraying machine, fanning mill, milking machines, and groomer should have individual drive.

Dairy Building Equipment: Milk cooling pump, cream separator, churns, butter worker, and refrigeration system can all be driven from countershaft with a motor of sufficient capacity to run any two machines on full load at the same time, or by individual drive if preferred.

Residence Equipment: Meat grinder, sausage stuffer, ice cream freezer, washing machine, and mangle can be arranged for driving by one motor connected to countershaft, the motor to be large enough to run the largest machine fully loaded. Vacuum cleaner, sewing machine, buffer and grinder, and residence water pump should have individual motors either belted or direct connected.

On farms raising considerable poultry, electricity can be used to good advantage for heating brooders and incubators. Often, too, the farmer finds it of advantage to employ electric trucks, if he is on the line of the local power company. He can charge these trucks himself by installing a battery-charging set with switchboard. An electric motor mounted on skids or a truck will do many of the barnyard chores in a small fraction of the time it takes to do them by hand.

And so it is all down the line; sort out the different kinds of work that have to be done on the farm and it will readily be seen that these items can be disposed of by means of relatively small motors. An advantage in driving barn and field machinery by electric motors is the fact that the power is instantly available. The motors required are light in weight and can therefore be installed without special foundations.

FARM POWER REQUIRED

The total amount of power required for farm operations is surprisingly large. Unfortunately there are no authentic figures available giving the total number of prime movers used in agriculture, but the following recently compiled table gives interesting estimates:

	Number	Horsepower
Horses	21,040,000	14,026,000
Mules	4,123,000	2,748,000
Steam engines	200,000	6,000,000
Gas tractors	300,000	7,500,000
Automobiles	2,000,000	30,000,000
Gas engines	1,000,000	2,000,000
Windmills	1,600,000	60,000
Total		62,334,000

There might be some objection to including the automobile in the foregoing classification, but it is recognized as standard equipment on many farms and should be included to make the story complete.

A Common-Sense Hydro-Electric Plant

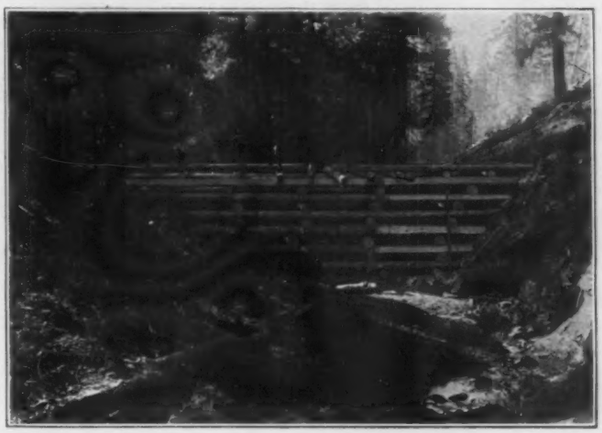
BY ROSS L. MAHON

(No one wants to leave the convenience made possible by electric power, even during the summer months, and for this reason the summer resort manager must devise some means of establishing the home electrical in the most out-of-the-way corner of the woods or mountains. An engineer with the Pelton Water Wheel Company tells here of the highly successful installation of a hydroelectric plant for the use of the Feather River Inn.—The Editor.)

The wide publicity which has been given, of late, to the development of some of the country's larger and more important water power projects, has undoubtedly impressed engineers, as well as the general public, with the sound, practical, common-sense nature of such undertakings. There is now no doubt but that the country, and particularly the West, looks to these larger developments for the solution of many of its power problems.

At the same time, the magnitude of these large projects and the immense investments involved should not cause us to forget or overlook the fact that there are many thousands of horsepower available from small streams, the amount of power developed by a single water wheel installation being comparatively little.

So, for fear that the small hydroelectric power plant with its great field of usefulness, be lost "in the shuffle," this short article has been written for the express purpose of showing what can be done throughout the mountainous regions of our Western states, in developing and utilizing small and apparently inconsequential streams in such a way as to result in the production of considerable power. The Western states are referred to particularly, as it is within their boundaries that comparatively high heads can often be obtained at least expense, and many of the mining and summer resort localities have not yet been reached by the transmission lines of the large hydroelectric power companies.



A view of the upstream face of the timber crib dam which was constructed to make a storage reservoir for use in generating the power for Feather River Inn, Plumas county, California.

Demand for Power in Remote Places —

In this region, just as elsewhere in the civilized world, electrical energy becomes a more and more important factor in every-day life. Small mountain towns and settlements must have lights for their streets and dwellings; mines must have power for their drills and hoists; and summer resorts must be able to provide their patrons with dependable service for lights, power and heat. In fact, the hotel guest will even expect better service than he sometimes enjoys at home, and the hotel or summer resort manager who does not realize this fact is rare indeed.

In past years, when people situated in this way finally realized the need for power, they have made use of some kind of fuel for its development. Wood, coal, and crude oil have all been used extensively in operating steam plants, and of course the modern gas engine, using some one of the refined products from crude oil, is now a very common and dependable source of power. But the days of cheap fuel are past. Lumber prices have risen to such an extent that a number of saw-mills cannot now afford to burn material previously used under their boilers. The country's coal supply becomes less each year, and its cost is increasing; the oil situation becomes more serious as time passes, with a constantly diminishing supply, increasing price, and actual scarcity occurring in states where it is taken from the ground and refined. Why, then, is it not logical to look for a source of power which requires no fuel, and thus becomes cheaper from year to year when we compare it with wood, coal, and oil?

The answer is water power, which is coming into more general use as the public becomes educated to its possibilities, and the man living in the mountains realizes that the common sense method of producing light, power and heat, even in very small amounts, actually lies at his own back door, in the form of a small, swiftly running, precipitous mountain stream. A properly designed water wheel, with its pipe-line and dam will transform the small stream into a power producer rivaling the gas or steam engine for dependability, and excelling them greatly in efficiency.

It is true that our modern summer resorts and hotels, located in the mountains of California, Oregon and Washington, have become an institution, as they are the summer playground for the city dweller and his family, all of whom are accustomed to depend almost entirely on electrical energy for their lights, power and heat.

DIARY OF AN OLD-FASHIONED FARMER'S WIFE

12:00 m. John late for lunch, mending windmill, out of order on first windy day for month.

MORE ELECTRICITY NEEDED ON THE FARM

Small Plant for a Summer Resort —

One of the most modern summer hostelries in California is located near Blairsden, Plumas county, California, on the Middle Fork of the Feather River. Opened in the summer of 1915, it depended at that time, for its light and power, on two gasoline engine driven electric generators, delivering 240-volt alternating current into the lines which served the main hotel building, as well as the hotel grounds and a large number of chalets or smaller cottages and tent houses with electricity. In order to keep this power plant in operation for about three and one-half months of the summer during June, July, August and September, it was necessary to ship in, each season, several carloads of gasoline and distillate. This was delivered by freight, over the main line of the Western Pacific Railroad to Blairsden, in steel drum containers, from which point a mile and a half haul by team was necessary in order to get the fuel to the power plant.

This plant was operated for some five years until, in the summer of 1919, an investigation was made of water power possibilities. A small stream, tributary to the Feather River and flowing through the hotel property, had previously been considered only large enough for supplying the domestic water system of the hotel, and accurate weir measurements made in September showed that during this driest period, the flow of water in it mounted to some 38 cubic feet per minute. This stream received its supply from springs and the flow varied very little throughout the summer season. In addition to this, 1919 was an exceptionally dry year, particularly in California.

A study of the ground indicated that at a distance of a little over three-quarters of a mile up the stream from the hotel, there existed an ideal site for a small storage reservoir, providing a dam of suitable size were built. A pipe-line or penstock, leading from this dam, along the side-hill of the small canyon, and then down a shoulder of the mountain to the hotel, would be able to deliver pressure water at the power plant under a static head of over 500 ft. The total connected load on the existing gasoline engine driven plant was then checked up, and it was found that a water wheel capable of delivering about 55 max. hp. to its electric generator, would be of sufficient capacity to take care of peak load conditions, which existed during the evenings.

New Plant for Feather River Inn —

The officials of the Feather River Inn then reached a decision to install the new hydroelectric equipment, as it was very evident that by doing so they would be able to make it pay for itself within three or four years' time.

The entire development consisted of storage reservoir, dam, pressure penstock, and the water wheel driven generator. No new switchboard equipment was required, as the outfit already in use with the gasoline engines was available. The necessity for water storage, however, was very apparent, as the minimum flow of the stream, some 38 cubic feet per minute, when delivered to the water wheel under about 470 feet effective head at the nozzle, all pipe friction losses deducted, would develop only 27 horsepower off the water wheel shaft. The characteristic load curve of the power plant indicated, however, that with practically no load from 11 p.m. until 7 a.m., and a very light load through the morning and afternoon, sufficient water could be stored to carry the heavy load through the evening. This made necessary the construction of a storage reservoir which would allow between 25 and 30 cubic feet of water per minute to accumulate during about 18 hours out of every 24, or a capacity of some 22,000 cubic feet, together with a closed pressure pipe from the dam down to the power plant. It is obvious that a flume or ditch, bringing the water from the dam to a forebay or pressure box at the pipe-line intake, would not have served the purpose, as it would have been impossible to obtain a storage capacity of 22,000 cubic feet elsewhere than in the bed of the stream, at any reasonable cost.

Storage Dam —

This is of the usual timber crib rock fill type. The bedrock of the stream bed was first stripped clean and the sides of the small canyon blasted out for the abutments of the dam. Rock and earth, taken from the stream bed and from the side-hills above the abutments of the dam, were used as a filler, after the timber crib work had been completed.

Timber crib dam showing location of sluice gate and headgate

A sluice-way pierces the dam at its lowest point, and is closed at the upper end by means of a wooden sluicegate, with a steel pipe or spindle operated by the usual floor stand, threaded bronze nut, and handwheel, located on a special platform extending from the upstream face of the dam.

The pipe-line also passes through the lower part of the dam, and has its intake in a riveted steel taper, having a special cast iron headgate. This headgate is, like the sluicegate, operated by means of a handwheel, located on the platform above it.

Pressure Pipe-Line or Penstock —

From the dam a pressure pipe-line, constructed entirely of riveted steel, carries the water down to the power plant. The length of this penstock, which is under pressure throughout the entire distance, is about 4300 feet, and the difference in elevation between the level of the water in the reservoir, when full, and the nozzle of the water wheel, is 522 feet.

The intake taper section at the upper end of the pipe-line is 15 inches in diameter at the large or inlet end where it connects to the headgate. To it is attached a vertical air inlet standpipe, 3 inches in diameter and rising to a point slightly higher than the top of the dam. In case the headgate is closed, this pipe provides a means of admitting air to the

pipe-line, thus preventing the formation of a vacuum in it, with the possibility of a collapse due to external pressure.

The pipe-line is buried about 24 inches beneath the surface of the ground wherever possible, and at those points where it crosses small depressions, earth embankments, with stone or timber retaining walls, nave been built.

Down near the power house a special flanged, cast iron tee has been introduced, to which is connected a special 4-inch diameter flanged gatevalve. This serves as a cross connection between the high pressure pipe-line of the hydroelectric plant and the domestic water supply system of the Inn, thus admitting the high pressure water into the lines in case of fire. The 4-inch gatevalve has a bronze disc and seat, in order to eliminate all possible chance of sticking or binding, under emergency conditions.

Power House —

At the lower end of the pipe-line, and within 80 yards of the Inn itself, is the new power house, built to take care of the new hydroelectric unit, as well as the gas engine driven generator, which was retained for standby purposes. The building is about 20 feet wide by 30 feet long, and of frame construction, being well lighted by means of several large casement windows. The general design is artistic and quite in keeping with the appearance of the other buildings which are grouped about the main building, or Inn proper. Heavy concrete foundations have been provided for both of the power units, and the entire interior of the power house has been carefully sealed and varnished. The tailrace for the water wheel unit has been excavated beneath the floor of the power house, and it carries the discharge water from the wheel out under the lawn into a large concrete lined swimming pool.

Hydroelectric Unit —

The pipe-line, coming into the power house beneath the floor line, is connected by means of a 45-degree elbow to the main inlet gatevalve of the water wheel unit. This is a specially designed impulse wheel, built by the Pelton Water Wheel Company for this installation, and direct-connected by means of a flexible coupling to an alternating current generator furnished by the General Electric Company.

This wheel is capable of developing 55 maximum horsepower at 1200 revolutions per minute, and the generator is rated at 37½ kva., 80% p. f., 240 volts, 3-phase, 60-cycle, and is equipped with a direct-connected exciter. The general construction of the complete unit is very well shown in one of the photographs.

The wheel itself, or runner, has detachable, phosphor bronze buckets, to which the water is delivered through a single, hand operated needle nozzle. Knowing the normal load requirements for the plant over a 24-hour period, the operator can, from time to time, adjust the nozzle, by means of a hand-wheel, in such a way as to discharge upon the wheel, exactly as much water as is necessary. This allows the water, which is saved by these nozzle adjustments, to accumulate in the storage reservoir at the intake of the pipe-line, thus making it available for use during periods of heavy load.

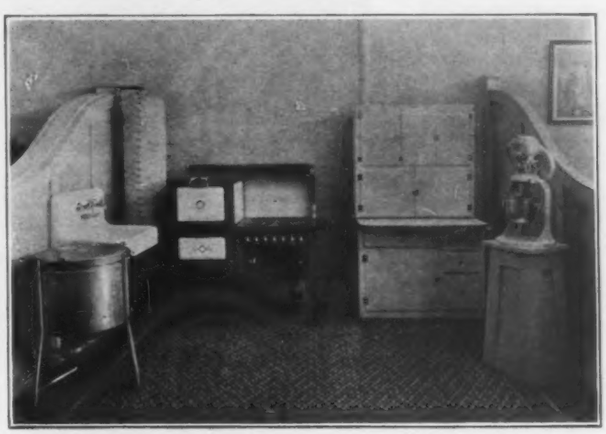
All bearings are of the ring-oiling type and an automatic governor has been provided by the water wheel builder, for the purpose of enabling the unit

Shop view of the direct-connected Pelton water wheel and the generator unit

to maintain constant speed and voltage, under fluctuating loads. This governor is of a special type, operated by pressure oil, and a flywheel mounted upon the water wheel shaft, assists and stabilizes its action. The governor operates a deflector within the wheel housing, which in case of a sudden reduction in load, cuts into the jet between the nozzle and the buckets of the wheel and deflects as much of it as necessary, into the tailrace.

All of the water wheel equipment, with the governor and the generator, were assembled upon a rigid cast iron bedplate in the works of the water wheel builder, before being shipped up to the power plant.

A DEMONSTRATION KITCHEN



A steady sale of electric ranges is the recompense of the Electrical Supply Company, Wenatchee, Washington, for maintaining this perfectly equipped electrical kitchen which is often the scene of cooking demonstrations.

DIARY OF AN OLD-FASHIONED FARMER'S WIFE

1:30 p.m. Iron last week's wash, walking 8 ft. with each iron.

MORE ELECTRICITY NEEDED ON THE FARM

Electromagnetic Calculation

BY H. H. BLISS

(The electric door-bell you use every day is an application of a common type of electromagnet. The following article, the ninth of a series, continues the discussion of the principles of electromagnetism introduced in the previous article. The author is on the staff of the Riverside Junior College, Riverside, California.—The Editor.)

Shapes of Magnets.—Electromagnets in the form of bars are seldom used, a much more common type being shaped somewhat like a horseshoe and presenting two pole faces to the "armature." This last is a piece of iron attracted to the magnet by the magnetic flux (Fig. A). The word "armature" is also given to the mass of iron supporting the copper inductors close to the poles of a generator or motor.

The winding in Fig. A is put upon the poles in such a way that one free end is N and the other S; the flux produced by the current in the coils runs through one pole piece, then the "yoke" connecting the poles, then the other pole, crosses one "air gap," runs through the armature, and finally crosses the other air gap to the first pole.

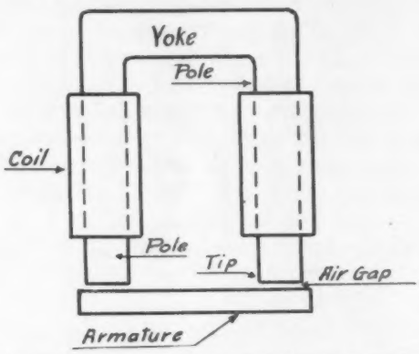


Fig. A. Diagram showing a horseshoe shaped magnet and its armature. The winding is put upon the poles in such a way that one free end is N and the other S.

In Fig. B is shown a typical application of the electromagnet of horseshoe shape, the electric door-bell. Current entering at binding post A energizes the magnet and passes through the clapper arm B to point C and so to the binding post D. The armature is drawn toward the magnet and the clapper strikes the gong, while contact at C is opened, thus stopping the current. A spring throws the clapper back to its first position and the operation begins again.

Ampere-turns and Permeability.—When a coil carrying current is filled with an iron core the flux is always very much greater than with a core of wood or brass or air. This effect is said to be due to the multiplying power or "permeability" of the iron. A doughnut-shaped coil, with sufficient ampere-turns to give 200 lines of force without iron, may produce 200,000 lines if the annular space is filled with wrought iron. Here the permeability is 1000, since it carries 1000 times as much flux as would be present otherwise.

The permeability is different for each grade of iron or steel, and it varies also with the flux present in any given sample. Cast steel, for instance, has a permeability of about 1100 with a "flux density" (number of lines per sq. in. of cross section) of 50,000, but its permeability is only 300 when the flux density is 100,000 lines per sq. in.

While the flux for a ring-shaped coil with a core of air (or of anything else except iron or steel) is given by the formula:

Flux = area $\times$ 3.2 $\times$ ampere-turns/length,

when there is an iron core the formula becomes:

Flux = area $\times$ 3.2 $\times$ permeability $\times$ ampere-turns/length.

If we divide both sides of the equation by the cross-section area, we have on the left side **flux/area,** which is the same as the **flux density,** and we have the formula in another form:

Flux density = 3.2 $\times$ permeability $\times$ ampere-turns per inch (since **ampere-turns/length** is the same as **ampere-turns per inch of length).**

Finally, we divide the 3.2 $\times$ **permeability** into the other side of the equation, obtaining:

Flux density $\div$ (3.2 $\times$ permeability) = ampere-turns per inch.

Examples.—How many ampere-turns are necessary to drive 150,000 lines for one inch through a piece of cast iron 3 sq. in. in cross section, the permeability being 110? What if the metal is replaced with wrought iron whose permeability = 1700? Flux density = 150,000/3 = 50,000 lines per sq. in.; 50,000/(3.2 $\times$ 110) = **142 ampere-turns per inch** for cast iron; 50,000/(3.2 $\times$ 1700) = **9.2** for wrought iron.

If a cast iron electromagnet of horseshoe shape (Fig. A) has a flux of 150,000, cross-section of 3

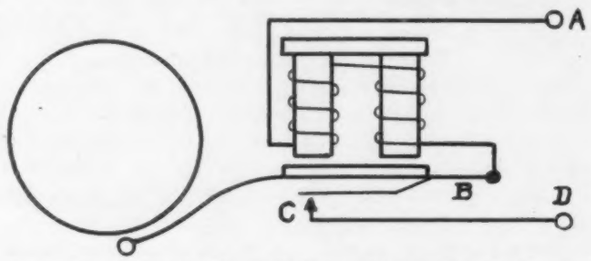


Fig. B. Diagram showing the application of the horseshoe shaped magnet in the operation of the electric bell.

sq. in., and a total magnetic length of 20 in., and if its wrought iron armature (in which the lines run for 7 in.) has a cross section of 2 sq. in. and a permeability of 1470, how many ampere-turns are required, on the assumption that the armature is in such close contact with the pole-tips that there are no "air gaps"? To drive the flux 20 in. through the cast iron takes 20 $\times$ 142 = 2840 ampere-turns; for 1 in. in the wrought iron it takes 75,000/(3.2 $\times$ 1470) = 16, and for 7 in. 7 $\times$ 16 = 112. Total = 1470 + 112 = **1582 ampere-turns.**

How many additional ampere-turns would be needed if the armature were ⅛-in. from the pole

faces? The permeability of air (as of practically all materials except iron and steel) being **one**, and the flux density being the same as in the pole faces, we have 50,000/3.2 = 15,600 ampere-turns per in. Total length of air gaps = .25 in., hence they require .25 × 15,600 = **3900 ampere-turns.** The total then would be 3900 + 1582 = 5,482 ampere-turns.

It is found in practice that in such cases as this many lines of force escape from the N pole of the magnet and get to the S pole through the air instead of going to the armature. They are then, of course, useless as far as pulling on the armature is concerned. This often makes it necessary to figure on from 1.2 to 1.5 times as much flux in the poles and yoke as in the air gaps and armature.

Table of Ampere-Turns.—For purposes of computing ampere-turns, etc., one must take into consideration the permeability of irons and steels under various conditions of flux density. The table below gives the data in the most convenient form, namely, the ampere-turns per inch of magnetic length for different flux densities. It was worked up by the use of the "ampere-turn formula" from the results of experiments on permeability. For instance, the permeability of sheet steel at 100,000 lines per sq. in. was shown by test to be 390; ampere-turns per inch = density/(3.2 × permeability) = 100,000/(3.2 × 390) = 80.

AMPERE-TURNS PER INCH

Flux Density	Air	Cast Iron	Wrought Iron	Cast Steel	Sheet Steel
30000	9400	40			
40000	12500	80			
50000	15600	140	9	14	6
60000	18800		10	16	7
70000	20900		13	20	10
80000	25000		18	28	16
90000	28100		30	43	32
100000	31200		70	103	80
110000	34400				177
120000	37500				360

Pull of a Magnet.—It is found that the pull of **one pole** of a magnet upon the armature may be accurately expressed by the following formula:

Pull × 72,000,000 = area × density × density,

where the pull is in pounds, the "area" being the area of the pole face in sq. in., and the density being the flux per sq. in.

For example, find the total pull upon the armature of a horseshoe magnet with a flux of 26,500 lines, the poles being circular and ¾ in. in diameter. Here the area = .785 × .75 × .75 = .442 sq. in.; density = 26,500/.442 = 60,000. Then the pull = .442 × 60,000 × 60,000/72,000,000 = 22.1 lbs. for one pole or **44.2 lbs.** for both.

Answers to First Magnet Problems

87. Resistance of each coil = 210 ohms. Current = 130/420 = .31 ampere; .31 × 700 = **217 ampere-turns.**

88. Ampere-turns per coil = 350 × 80/210 = 133.3. Total = **267 ampere-turns.** Lifting force will be only a trifle over 55 lbs., since the magnet was saturated with the smaller number of ampere-turns.

89. In Problem 87, power = **40.3 watts** = .0403 kw-hr. per hour, or 3412 × .0403 = **137.6 B.t.u. per hr.** In Problem 88, power = **61 watts**, giving **208 B.t.u. per hr.**

90. Periphery = 3.14 × 5.5 = 17.3 in. Area = 7.8 × 17.3 = **135 sq. in.**, allowing **67.5 watts** at .5 watt per sq. in.

91. Amperes × amperes × ohms = 67.5; amperes × amperes = 67.5/30 = 2.25; amperes = sq. root of 2.25 = 1.5. Then volts = 1.5 × 30 = **45.**

92. We must have 2.5 × 600 = 1500 ampere-turns to get the required flux. Then with 820 turns the current must be 1500/820 = 1.83 amperes. 1.83 × 14 = **25.6 volts.**

93. 120/3 = 40 ohms, resistance of coil. 40/.2 = 200 turns of wire. 3 × 200 = **600 ampere-turns.** 120 × 3 = **360 watts** = .36 kw. .36 × 3412 = **1228 B.t.u.**

94. Heating 800 cu. ft. 1° takes .02 × 800 = 16 B.t.u.; for 15° it takes 15 × 16 = 240 B.t.u. In 1 hr. the heat developed = 240 × 60 = 14,400 B.t.u., corresponding to 14,400/3412 = 4.22 kw-hr. per hr. The power is then **4.22 kw.**

95. Cylindrical surface = 160/.8 = 200 sq. in. Periphery = 200/7.4 = 27 in. Diameter = 27/3.14 = **8.6 in.**

96. Area = .75 × .75 × .7854 = .442 sq. in. Ampere-turns = 67 × 12/(3.2 × .442) = 568; current = 568/150 = **3.8 amperes.**

97. Flux = 3.2 × 13 × 620 × 10/30 = **8,600 lines.** Wood and brass would not change the flux at all; with an iron core there would be many times as many lines as with an air core.

Second Set of Magnet Problems

98. From the table of "Ampere-turns per inch" determine the permeability of cast iron at density = 40,000; of the other three metals at density = 70,000.

99. "Interpolate" in the table to find the ampere-turns per inch for cast iron at density = 35,000, for cast steel at density = 88,000, for sheet steel at density = 92,000.

100. Find ampere-turns necessary for a horseshoe electromagnet of sheet steel with a cast steel armature .025 in. away from the pole ends. The flux across the air gaps must be 45,000 lines; the cross section of the armature is .5 sq. in. and its length is 3 in.; flux travels 8 in. in the magnet, which has a cross section of .7 sq. in. There is so much leakage that it is necessary to provide for 1.55 times as many lines in the magnet as across the air gaps; in other words, the "leakage coefficient" is 1.55.

101. How strong is the attraction between a straight bar electromagnet and its armature with a flux of 78,500 lines, the diameter of the magnet being 1.4 in.?

102. What is the pull of this magnet, with the same total flux, if the edge is beveled off so that the diameter of the pole face becomes 1.1 in.?

103. A magnet has two wrought iron pole pieces each 10 in. long and 2 in. in diameter, connected by a cast iron yoke 6 in. long and 7.14 sq. in. in cross section. The armature, of wrought iron, 1 in. × 3 in., is .015 in. from the pole tips, and the flux is 250,000. Find total ampere-turns if there is no leakage.

104. Work Problem 103 assuming leakage coefficient = 1.14.

105. A horseshoe magnet with cross section .75 × .9 in. must lift a total of 30 lbs. Find density and total flux required.

106. The armature of the above magnet is of cast steel, .27 sq. in. in cross section and 4 in. long (between centers of poles). Each air gap is .01 in. long. What ampere-turns are required for the gaps and armature?

107. This magnet itself is of cast iron, and the magnetic length is 13 in. What is the "leakage coefficient" if it is necessary to send 10 amperes through the 273 turns of the winding to get the pull of 30 lbs.?

108. A magnetic circuit consists of 7 in. of cast iron of cross section 2.10 × 2.38 in.; 6 in. of sheet steel 1.25 × 1.60 in.; 15 in. of cast steel 1.47 × 1.70 in.; and one air gap 1.47 × 1.70 in. which is .03 in. long. What total flux is set up by 2.5 amperes in 884 turns of wire, if there is no leakage? (Solve by "trial and error"—guess at the answer and compute the necessary ampere-turns.)

DIARY OF AN OLD-FASHIONED FARMER'S WIFE

1:45 p.m. John Jr. gives up fishing to saw wood.

MORE ELECTRICITY NEEDED ON THE FARM

Pamphlets and Clippings in a Business Library

BY VIRGINIA FAIRFAX

(Business facts come into an office from innumerable miscellaneous sources, and unless properly handled, are lost to the organization. Some channels through which useful material may be obtained are here taken up in part two of the third article of a series by the librarian for the Carnation Milk Products Company, Chicago. Permission to reprint must be secured from Journal of Electricity.—The Editor.)

SOURCES FROM WHICH MATERIAL IS SECURED—II.

Miscellaneous Sources

The Pan-American Union, Washington, D. C., is a valuable source for information pertaining to Mexico, Central and South America. Besides its monthly magazine it publishes bulletins and maps which include information necessary in trading and traveling in these countries. The Union has also published a helpful "Reference List of Commerce, Exporting and Importing," giving a bibliography of books, pamphlets, magazine articles, and commercial magazines of South American countries.

The Philadelphia Commercial Museum, Philadelphia, Pa., is a great trade promoting agency. Its foreign trade information service ranks only second to that of the Bureau of Foreign and Domestic Commerce.

The American Express Company, 65 Broadway, New York City, issues in bulletin form, information that is worth while and is another source for business facts.

The Federal Trade Information Service, business office, 175 Fifth Avenue, New York City, publishes a daily bulletin and states that "The purpose of this service is to make available immediately, with interpretative matter, the important information of the Federal Government affecting various departments of corporations; banks and their clients; commercial organizations and their members." It is also an excellent source for noting government information which is issued in pamphlet form, notices of which usually appear in this service more promptly than elsewhere.

Standard Statistics Company, 47 West Street, New York City, issues a daily service similar to the Federal Trade Information Service but broader in scope. Its service is not confined to the Federal Government but aims to cover all basic information affecting trade and industry.

The Investors' Book of Booklets, published monthly by Rudolph Guenther-Russell Law, Inc., 25 Broad Street, New York City, $2.00 per year, includes a list of booklets and circulars issued from time to time by the leading financial houses of the country, setting forth the conditions and prospects of investments in individual companies, industrials, railroads and public utilities. As the status of such literature is constantly changing, the value of the Investors' Book of Booklets depends entirely upon its being promptly used.

The Publishers' Weekly, published by R. R. Bowker Company, 62 West 45th Street, New York City, in its weekly record of new publications lists in small type at the bottom of each page the authors and titles of new pamphlets on a variety of subjects with the address of the publisher and the price.

The Corporation Journal, published monthly except in July and August by the Corporation Trust Company, 37 Wall Street, New York City, "furnishes corporation attorneys and others interested, a brief account of current happenings, of recent court decisions, new laws, etc." The company also publishes other pamphlets relative to corporation laws in various states which, in addition to the Journal, are sent without charge.

The Public Affairs Information Service, published by The H. W. Wilson Company, 958 University Avenue, New York City, is a valuable subject index to "all kinds of publications—books, pamphlets, government documents, proceedings of associations and even unpublished manuscript, as well as many periodical articles." It may be subscribed for as a weekly or bi-monthly cumulative service according to the needs of the business organization.

The Industrial Arts Index and the **Agricultural Index,** which are issued monthly by The H. W. Wilson Company, not only index under subjects articles to be found in a large number of periodicals, but they also subject index the pamphlet publications and reports issued by various departments of the Federal and State Governments and by individual organizations.

The Statesman's Year Book, published annually by Macmillan & Company, London, but to be had from any large book store in this country, in addition to giving statistics and information of varied character on all countries and colonies of the world, appends at the end of each section a bibliography of official and non-official books and pamphlets on each country. It is an excellent source for obtaining the names and addresses of official publications of foreign countries.

The Argentine Year Book, the **Japan Year Book,** the year books of all foreign countries, are also sources for pamphlet material, particularly for references to government publications of the respective countries.

Personal Notes and Correspondence

A source of information often neglected by business houses is that within the organization itself, and is to be found especially in its correspondence and reports. A great deal of valuable information is gathered together in field work and in special investigations made by the members of the branches and

departments of an organization, which remains, more or less, in the personal notes of the men making the investigations. Some of these data may be gleaned from their letters and reports, copies of which should be made for the information files, but it is a better plan to have the business organization require these experts to outline briefly for the information files the results of their studies and investigations. By this means a wealth of information will be gathered for the permanent use of the whole organization that otherwise would be lost if these employes left the organization for other positions.

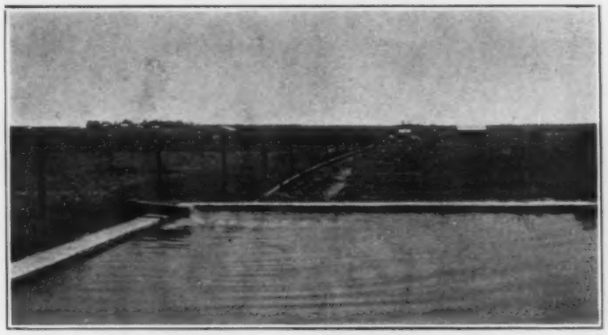
Selection of Material

It is impossible in one or two short articles to list the many sources for information in pamphlet form, or that to be found on specific subjects. With these general sources, as given above, a librarian in a business library begins the organization of data or reference files and from these, new sources of information are constantly being suggested. It is not intended to recommend that all business organizations proposing to organize such files should subscribe for or purchase all of these aids to the accumulation of business facts. Where it is not practical to purchase these helps the business librarian should make it one of his duties to visit regularly the public library in his city and read and check the suggested sources, if available, for the facts desired, and to anticipate the needs of the business organization and obtain for the files the facts that later will be required.

In selecting material the important requisite, next to knowing sources, is discriminating judgment. The purpose is never to gather a quantity of facts. Space is too valuable in business offices to fill it with printed material that holds no interest for the business house, no matter how valuable it may be to some other house.

In order that the business librarian may be kept in touch with the interests and needs of the business house, the management should cooperate and keep the librarian informed of their needs and new interests as they develop. When the administration of these reference files is in the hands of one person he becomes familiar with the requests and reference questions made to him and learns what to select as of value and what may be discarded. His newspaper and periodical reading will keep him informed as to current events and assist him in choosing live subjects, and day by day as new pamphlets and clippings are added to the file, old ones that are superseded by later information may be discarded. It is a wise plan, however, to take stock once a year and clear the files of out-of-date material and prevent them from becoming historical instead of full of live and current material.

ELECTRIC IRRIGATION IN TH E INTER-MOUNTAIN DISTRICT



Typical installation at Centerville, Utah

Typical farm being irrigated electrically

That the many advantages of electric irrigation are steadily making themselves better recognized by the irrigator, is indicated by the fact that prospective new users of electric irrigation service for the coming season in the territory served by the Utah Power & Light Company are fast getting their plants installed and in shape for operation. The installations going in give a striking illustration of the extreme flexibility of the electric power irrigation plant. The plants include those designed for pumping from sloughs, canals, rivers, dug and drilled wells, and embrace horizontal and vertical centrifugal as well as plunger pumps. Neither are the installations restricted as to size. Those already contracted for this year range from 1000 hp. to 5 hp.

Electrically operated pumping installation on a Utah ranch.

Installation drawing 600 gallons per minute from well 42 ft. deep

DIARY OF AN OLD-FASHIONED FARMER'S WIFE

1:50 p.m. All hands turn in and manage to shear 52 sheep by dinner time.

MORE ELECTRICITY NEEDED ON THE FARM

SPARKS—Current Facts, Figures and Fancy

(The cost of being in the dark, the progress of the electrical idea in India and the piloting of vessels by radio are among the subjects treated on this page. The wealth of Sacramento, the traffic cop's farewell and the latest dream of Colorado Springs are also discussed in brief.—The Editor.)

The West need not fear a cider shortage since Washington produces 20 per cent of the country's apples. The Wenatchee and Yakima valleys are known to ship more than 16,000 cars of apples in a year.

* * *

The electrical idea is creeping into the minds of India's higher caste, according to a recent report that the only living Buddha has ordered two Delco farm lighting sets in order that the royal palace may be all lit up.

* * *

Considering her size, Sacramento is the richest city in the United States in that she leads in bank deposits. With a population of 66,000, the deposits in the several banks amount to $66,000,000, which exceed that in the treasury of many cities twice her size.

* * *

Poor illumination is surprisingly expensive, according to the figures of an insurance expert, who states that $300,000,000 is the annual loss in the country due to poor lighting. And further, this amount exceeds the total annual cost of illumination at this time.

* * *

To treble one's size is no easy matter, but the electrical industry must do as much if the nation's available water power is to be developed. Government figures infer that it will cost between $6,000,000,000 and $10,000,000,000 to develop the potential water supply of the United States, and this means a trebling of the industry's capitalization.

* * *

The West needs engineers more than any other section of the country and so the West is producing them. The University of California students stood first in a psychological test given 10,000 engineering freshmen in fifty American colleges and universities. The examinations given included a test on general intelligence and five tests on high school subjects, including physics, chemistry, mathematics and manual training.

* * *

Fogs will no longer be a factor in the delay of ships, according to a report which comes from Fort Lafayette, where a vessel was piloted into port by means of a magnetized pilot cable. With the windows of the pilot-house covered by heavy canvas, the commander picked up the cable and guided the ship by "listening in" and steering to port or starboard as the volume of sound indicated his position. The cost of equipping a vessel with receiving apparatus for this purpose is estimated at $1,200, while delay because of fog may cost an ocean liner as much as $500 an hour.

* * *

Speaking of Thanksgiving, we might even be thankful for the automobile tire, even if it does go flat once in a while. In Germany the price of rubber tires still puts them beyond the means of most local motorists, so the iron rim still is very much in vogue. Some of the more prosperous citizens use a thin coating of rubber about the rims of their machines, but few even indulge in this luxury.

* * *

Speaking of Western dreams, Colorado Springs announces a big one which will put her among the most electrical of electrical cities. It is estimated that by an additional expenditure of approximately $650,000 the city of Colorado Springs can, by use of its present water supply reinforced by diversion from a certain creek through existing and new power houses, generate 15,115,400 kw-hr. per year. And then, in case this will not meet the demands, it is estimated that by an additional expenditure of $1,125,000 an additional 8,095,400 kw-hr. annually can be obtained.

* * *

We've said farewell to the "steno," the horse and even to the cow, but now Los Angeles is saying farewell to our old friend, "the traffic cop." Electrically controlled semaphores, operated from a central station, are being used to cope with the traffic situation on Broadway. To switch the traffic from north and south to east and west the signals first emit a warning ring, the red light goes out and the green light shows, and semaphore arms bearing the word "Stop" fold away to give place to arms that say "Go." The signals work independently of each other, or work from a central control, according to the convenience of the police.

* * *

Centralized regulation of the production and distribution of electric power and light is the aim of the free city of Danzig, in fostering a project which provides for the creation of a board of electricity whose duties would cover all questions connected with the city's supply of electric current. The project further provides for an advisory council to be composed of seven representatives of the city of Danzig, one representative of each of the remaining municipal and rural districts, one representative of large industry, one of agriculture, and one of small industrial consumers, and two members of the Danzig magistracy.

PERSONALS

Arthur H. Markwart will fill the position of director of engineering which has recently been created as a part of the organization of the Pacific Gas & Electric Company. Mr. Markwart up to this time has been well known as a member of the firm of Galloway & Markwart, Civil Engineers, San Francisco. He was prominent from 1912-1915 as Chief of Construction with the Engineering Department of the Panama-Pacific International Exposition. Mr. Markwart is a graduate of the University of California with the class of 1903. Soon after his graduation he was an engineer with the California Gas & Electric Corporation, now Pacific Gas & Electric Company, at which time he was appointed assistant civil engineer for the corporation. Later he was chief engineer and manager of the Syndicate Water Company of Oakland and vice-president and manager of the Richmond Water Company. In 1907 he became a member of the firm of Galloway & Markwart which has been especially active in making investigations and reports on hydroelectric plants and irrigation systems, and has designed and constructed bridges and buildings involving many millions of dollars.

Herbert C. Hoover, president of the American Institute of Mining Engineers, is a recent San Francisco visitor.

H. J. Bennett has been made purchasing agent for the Western States Gas & Electric Company, Stockton, California.

J. O. Presbrey, Western representative of the Ivanhoe Regent Works, Cleveland, Ohio, has transferred his office from St. Louis to San Francisco.

J. R. Wilson has succeeded **Ed. Peterson** as district manager of the Washington-Idaho Water, Light & Power Company at Castle Rock, Washington.

H. C. Parmelee, editor of Chemical & Metallurgical Engineering, has been elected as a member of the executive committee of the National Conference of Business Paper Editors.

H. P. Davis, vice-president of the Westinghouse Electric and Manufacturing Company, and **W. K. Dunlap**, acting vice-president of the same company, have been recent visitors on the Pacific Coast.

James H. McGraw, president McGraw-Hill Company, Inc., was elected vice-president of the Associated Business Papers, Inc., at its fifteenth annual convention held recently in New York.

R. E. Collom, federal deputy oil and gas supervisor, with headquarters at the San Francisco office of the U. S. Bureau of Mines, attended the convention of the Independent Oil Men's Association, held at Denver, September 28 to 30.

M. J. Gavin, refinery engineer of the Salt Lake City station, U. S. Bureau of Mines, who is in charge of the Bureau's oil shale development work, spent several weeks at the San Francisco office of the Bureau during October.

G. W. Muench, formerly master electrician of the Triangle Electric Company, Inc., 909 East Pike Street, Seattle, was recently appointed manager of that company. Prior to his connection with the Triangle Company Mr. Muench was for some years associated with the Seattle Engineering School as instructor in gas engine electrical appliances. He has been identified with automotive electrical work for the past fourteen years.

W. H. McGrath, vice-president of the Puget Sound Power & Light Company, with **H. J. Gille**, district sales manager, **G. E. Quinan**, chief electrical engineer, **L. R. Grant**, manager appliance department, and **R. W. Lindley**, assistant sales manager, Bellingham division, all executive officials of this company, have returned from Boston where they were called early in October to attend a Sales Managers' Conference held by the Stone & Webster interests.

Robert Sibley, editor of the Journal of Electricity, has left for a business trip to the East. He will attend the first meeting of the American Engineering Council which is to be held in Washington, D. C., November 18-20, and will then go to New York where he will attend the national meeting of the A. S. M. E., December 7-10, and will visit the central office of the McGraw-Hill Company, Inc. Mr. Sibley is planning to return to San Francisco on December 15.

E. O. Shreve, San Francisco manager of the General Electric Company, has returned from a trip to the East where he visited the main offices of the company at Schenectady, New York. He attended a conference of the International General Electric Companies at Brier Cliff and among other visits reports one to the New York offices of the McGraw-Hill Company, Inc. Mr. Shreve says that the general feeling in the East is that there will be a general period of recession but that conditions will soon be back to normal and that a period of great prosperity can be looked to.

Frank F. Fowle and **James R. Cravath** have formed a consulting engineering partnership under the firm name of Fowle & Cravath, with offices at 1201 Monadnock Block, Chicago. Frank F. Fowle, who until recently served as one of the receivers of the Central Union Telephone Company, was formerly a consulting engineer. James R. Cravath is a well-known consulting electrical and illuminating engineer of Chicago. The services of the firm will be devoted to investigations, research, design, supervision, management, appraisals and rate cases in the several fields with which the partners have heretofore been identified.

L. M. Klauber has recently been promoted to be general superintendent of the San Diego Consolidated Gas & Electric Company, of which he was previously assistant general superintendent. He graduated from Stanford University in the department of electrical engineering in 1908. From 1908 to 1910 he spent in the Westinghouse Electric and Manufacturing Company's graduate apprentice school at East Pittsburgh, Pa. His first position with the San Diego company was that of new-business solicitor, after which he served as engineer in charge of record department, superintendent of electric department and assistant general superintendent. He is vice-chairman of the overhead systems committee of the N. E. L. A., a member of the electrical apparatus committee and chairman of the Pacific Coast engineering committee.

DIARY OF AN OLD-FASHIONED FARMER'S WIFE

6:45 p.m. Crush five barrels of apples in hand press. Set aside for several weeks.

MORE ELECTRICITY NEEDED ON THE FARM

Dr. Joseph F. Merrill, chairman of the Utah Section of the American Institute of Electrical Engineers, is dean of the engineering college, University of Utah. Dr. Merrill received his Bachelor of Science degree from the University of Michigan in 1893, and continued his studies at the Johns Hopkins University, receiving his Ph.D. from that institution in 1899. His first teaching experience was as assistant professor of chemistry at the University of Utah in 1897. He became director of the Utah state school of mines and engineering at the University of Utah in 1898, and professor of physics and electrical engineering at that institution in 1899. Dr. Merrill has contributed largely to the electrical engineering profession through extensive research work. Some of his more important theses are as follows: Effect of dielectric on electrical resistance; effect of temperature and pressure of electrolysis of silver nitrate; reliability and durability of commercial integrating meters. He has been one of the most active members of the Utah section of the American Institute of Electrical Engineers since its organization about four years ago. The Utah section will act as host to the national society at the annual convention at Salt Lake City next June.

E. B. Criddle, general agent of the Southern Sierras Power Company, is among recent San Francisco visitors.

B. H. Hurd, of the California-Oregon Power Company, has returned to San Francisco after a tour of the company's system.

W. F. Rawdon has been made Thor Washing Machine specialist in the Seattle office of the Pacific States Gas & Electric Company.

H. L. Jackson, manager of the Western States Gas & Electric Company, Eureka, California, spent a few days in San Francisco recently.

H. S. Warren, public relations engineer for the American Bell Telephone Company, with headquarters in New York, is a recent San Francisco visitor.

R. W. Davenport, a hydraulic engineer on the staff of the United States Geological Survey, has been transferred temporarily to the staff of the Federal Power Commission.

K. G. Dunn, having sold his interest in Hunt Mirk & Co., consulting engineers at San Francisco, has retired from the firm and is devoting his attention to his private interests.

James Allan, who has been assisting in the advertising department of the Pacific States Electric Company, San Francisco, has been transferred to the industrial department for central California, with offices in San Francisco.

C. P. Bowie, petroleum engineer of the U. S. Bureau of Mines, has returned to the San Francisco office after an absence of nearly two and a half months spent at Washington, D. C., and in inspection work at various Eastern and Mid-Continent fields.

L. E. Voyer, illumination engineer with the General Electric Company, San Francisco, has returned from an extended trip throughout the East. He visited various factories of the company and attended the convention of Illuminating Engineers which was held in Cleveland, Ohio.

D. J. Wheat, who has been superintendent of the Alameda County Gas Company District of the Pacific Gas & Electric Company, has resigned that post to become general manager of the Wheat Electric Company, electrical contractors and dealers, at Santa Maria, California.

W. J. Canada, electrical engineer with the National Electric Light Association, formerly with the U. S. Bureau of Standards and now devoting his time to the study of inductive interference, is recent Pacific Coast visitor and has spent some time in San Francisco and Los Angeles.

A. B. Thompson, railway specialist in the San Francisco office of the General Electric Company, has returned from the East where he attended the American Electric Railway convention at Atlantic City. Mr. Thompson visited the factories of the company and returned via the Chicago, Milwaukee & St. Paul Railway.

Josiah C. Moore, engineer for the Aero Alarm Company, Seattle, has been granted a leave of absence by the company, to go to St. Louis, Mo., for the purpose of designing a large power plant and general equipment engineering work for the James Black Masonry & Contracting Company. Mr. Moore will be gone about two months.

Robert W. A. Brewer, who was a San Francisco consulting engineer until the first of this year and who is now consulting engineer with a large automobile manufacturing concern in Cleveland, Ohio, is leaving for a visit in England on November 17. It is reported that while in London Capt. Brewer will read a paper on Vacuum Valves.

George W. Danforth, Lieutenant-Commander, U. S. Navy, has recently retired and taken up a small farm in the Napa valley. Mr. Danforth is well known on the Pacific Coast for the excellent work he has done in mechanical engineering for the Navy and for his work in San Francisco at the time of the Panama-Pacific Exposition in 1915.

A. L. Kempster, general manager of the New Orleans Railway & Light Company, who has been visiting and closing up business affairs in Seattle, recently left that city for New Orleans. He was manager of the Seattle division of the Puget Sound Traction, Light & Power Company until the traction lines were taken over by the city of Seattle in April, 1919.

C. L. Chamblin, manager of the California Electric Construction Works of San Francisco and president of the California Association of Electrical Contractors and Dealers, is leaving San Francisco November 15 for Los Angeles where he will attend the meeting of the State Advisory Committee of the Association. At this time it is expected that definite plans for the Los Angeles industrial lighting exhibit will be made.

Charles Butters, with the water power and irrigation department of Tasmania, was a recent Utah visitor, looking into the problems of service. Mr. Butters states that Tasmania is entering upon a most comprehensive plan for the utilization of water power and that irrigation is a big question in that country. He also spoke of the international fame which Utah has achieved because of its splendid irrigation systems.

George L. Myers, assistant to the president of the Portland Gas & Coke, Pacific Power & Light, and Walla Walla Valley Railway companies, has been elected vice-president of the Northwest Electric Light and Power Association for the state of Oregon at the recent Spokane convention. For some time Mr. Myers has been especially active in the electrical activities of the Northwest. Previous to his association with the companies mentioned he was with the Oregon-Washington Railroad & Navigation Company. In 1912 he became treasurer of the Pacific Power and Light Company and private secretary to the president of the three associated companies.

HAPPENINGS IN THE INDUSTRY

REORGANIZATION OF P. G. & E. FORCES

The Pacific Gas & Electric Company of California has reorganized its forces for the purpose of bettering its service and establishing a precise distribution of responsibility.

Committees have been appointed to act in an advisory capacity to executives, and the new positions of director of engineering and executive engineer have been created.

Under the reorganization scheme, Wigginton E. Creed, president of the company, will give special attention to major financing, and with the assistance of an advisory committee will regulate the general policies affecting the operation and regulation of the concern.

John A. Britton, vice-president and general manager, will be in charge of the general operations of the company and will specialize in all matters pertaining to construction, operation and maintenance, contact with the Federal Water Power Commission, competitive conditions and relations with other operating companies. Those who will report to him are the director of engineering, executive engineer, attorney, attorney rate department, manager of the claims department, manager of the property department and the manager of the lands and tax department.

A. F. Hockenbeamer, second vice-president and treasurer, will be in immediate charge of the company's finances, accounting, purchasing and warehousing. The following heads of departments will report to him: secretary, assistant secretaries, assistant treasurers, transfer agent, general auditor, purchasing agent, superintendent of supplies, credit manager and manager of the stock sales.

P. M. Downing, vice-president in charge of electrical construction and operation, will have control of all electrical construction, maintenance and reconstruction, the operation of all hydroelectric and steam-power houses, transmission and distributing lines and substations connected therewith, the street railway system at Sacramento and all water systems of the company.

F. A. Leach, Jr., vice-president in charge of public relations and service, will have control of all commercial activities, public relations, division managers and officers under them, and the gas-manufacturing and distribution departments. Reporting to him will be the gas engineer, manager of the commercial department, manager of the publicity department and division managers.

The new engineering department will be headed by A. H. Markwart. He will have charge of the designing of all company plants and equipment.

The new department of the executive engineer will be headed by W. G. Vincent, Jr. He will have charge of rate schedules and the collection of data on company property, also studying economic factors for the guidance of the various departments.

ELECTRIC MANUFACTURING COMPANY NOTE ISSUE

The recent $30,000,000 note issue of the Westinghouse Electric and Manufacturing Company was entirely taken up within two hours after it was placed on the market and the notes are now selling at a premium. These were issued as ten and a half-year 7 per cent notes at 94¾, to yield approximately 7¾ per cent. Notes are issued to reduce notes and accounts payable.

The National City Bank of San Francisco is the western house handling these notes.

DECISION ON UTAH "SPECIAL CONTRACT"

Approximately $1,000,000 will be added annually to the revenue of the Utah Power & Light Company through the recent decision of the public utilities commission of Utah in what is known as the "special contract" cases involving the company's standard power schedules in Utah. By this decision a number of "special" contracts with large power users, which have been in existence for some time, have been declared discriminatory, and these customers are ordered placed on the company's standard schedules.

The contracts involved were entered into before the commission came into existence, and before the power company's present standard schedules were adopted. The commission holds, however, that it has jurisdiction over these contracts, and therefore that it has power to modify the rates mentioned therein.

"The leading thought of the public utilities act," says the decision, "would seem to be that the control of service corporations is taken over by the state; and that power and authority is vested in the commission to supervise and regulate any and all things which are necessary in carrying out the purposes of the law."

It is pointed out that to be effective such control and regulation must include both rates and contracts. It holds that there is no contention on the part of the state that the special contracts under investigation were not legal when made. The contracts, the commission says, contained rates that would persist and

"continue legal unless and until the state steps in and assumes jurisdiction as to said rates."

"The exercise of this right by the state is in the interest of the public generally; primarily to make certain that all sections of the public are being fairly treated as to cost of service. The interest of the public is paramount, and individual and private contracts, if found to be discriminatory or preferential, must give way to furtherance of the principle of justice."

The decision means that approximately one million dollars annually will be added to the revenue of the power company.

Applications for rehearings have been filed by the following:

C. R. Hollingsworth of Ogden, representing the two Ogden cement companies; the Associated Canal companies; Van Cott, Riter & Farnsworth filed applications for the Salt Lake & Utah, the Denver & Rio Grande, the Salt Lake City Union Depot and Railroad Company, the Salt Lake Terminal Company and the Deseret News; Dey, Hoppaugh & Mark filed a petition for the Utah Metal & Tunnel Company; Howat Marshal, MacMillan & Crow for the United States Fuel Company; B. L. Liberman for the Utah Iron & Steel Company and the Utah Steel Corporation; and DeVine, Stine & Gwilliam for the Utah-Idaho Central and the Bamberger Electric Railroads.

NEW RATES FOR PUBLIC SERVICE UTILITIES CONSIDERED BY THE COMMISSION

The Railroad Commission of the state of California is directing an investigation in the matter of rates to be charged for gas and electric energy by the various public service utilities of this state.

These utilities are now operating under war emergency rates, which were granted by the Commission from time to time during the last three years. The advances which have been granted approximate 20 per cent over the pre-war rates and were granted only as a temporary relief to the utilities.

DIARY OF AN OLD-FASHIONED FARMER'S WIFE

7:15 p.m. Feed stock by lantern light. Drop lantern. Set fire to barn.

MORE ELECTRICITY NEEDED ON THE FARM

The entire question of rate structure for electric companies will be considered at the various hearings which have been planned in all parts of the state.

It is expected that the whole question of rate base will be determined anew at this time, and the inquiry gives promise of being the most important ever begun by the Commission. Many involved questions of finance and valuation must necessarily be decided upon at this time. It has been contended by power companies' attorneys that electric rates should be based upon the cost of generating power in steam plants operated by oil under increasing oil costs. They say that any other principle of rate fixing will cause bankruptcy to certain companies.

The hearing to determine the rates to be charged by the Great Western Power Company in the various cities served by this utility began Monday, November 8. The Pacific Gas & Electric Company hearing follows on November 15.

SOUTHERN CALIFORNIA EDISON COMPANY RATE CASE

Hearings in connection with the application to establish regular rates for Southern California Edison Company were resumed before President Edgerton of the Railroad Commission in Los Angeles on October 25, after an adjournment of the first session called September 16.

A novel element has been brought into the case by the Edison Company's argument that the company's ability to carry out its building program should have a place in establishing a rate base alongside the customary historical value of past investments. They submit that the completion of the Big Creek program on schedule time and to the best economic advantage demands a steady flow of new money into the enterprise and that this flow must not be interrupted by frequent rate changes which ordinarily would arise from emergency conditions such as the water shortage of 1920.

For the purpose of avoiding such possible rate adjustments they propose a new item in their financial statement to be called an "equalizing reserve" which will be established in the first instance by the voluntary contribution from earnings. Once established, the fund will be increased in years of favorable operating conditions and will be drawn upon when the circumstances are reversed. It is pointed out that the plan does not contemplate adjustments to meet general fluctuations in commodity prices but merely to meet unusual and unforeseen conditions such as "dry" years, labor costs, and serious accidents to plant.

In addition to the equalizing reserve it is proposed to establish a "Reward for Efficiency" account which will be in the nature of employes' participation in earnings. It is expected that the fund will be readily maintained without cost and with profit to the consumer as it will be a direct appeal to employes and will result in a degree of personal efficiency heretofore unknown in the public utility field.

Following the hearing in Los Angeles, adjournment was taken to Visalia at some later date for the benefit of the San Joaquin Valley consumers of the Edison company.

SEATTLE ESTABLISHES ELECTRICAL CODE

An electrical safety code has been established by the city of Seattle. Section 1 of the ordinance reads as follows: "The following provisions shall constitute the electrical code which shall apply to all the electrical equipment hereafter installed in the City of Seattle, but shall not be construed to require that electrical equipment heretofore installed be reinstalled until the same shall be found unsafe."

Under this code it is required that a Superintendent of Buildings inspect all work done and shall be given power to suspend any installation which he considers unsafe. A permit passed upon by the Superintendent of Buildings is required for all installations.

Wiring rules for general work are given in detail. Rules for meter location, conduit construction, armored cables, use of metal molding, grounding, knob and tube wiring, and the installation of service fixtures and cutouts are all given in detail as well as rules for the installation of cabinets and cutout boxes, fixtures, sockets, flexible cords, generators and motors, switchboards, cranes, heaters and ranges, electric signs, transformers, elevators, and all theatrical equipment.

SELLING ILLUMINATION

The man of industry appreciates what good lighting will do, but he seldom appreciates what good lighting really is. For this reason, the Industrial Lighting Exhibit Committee of the California Electrical Cooperative Campaign has planned a permanent industrial lighting exhibit for the city of San Francisco. The exhibit is practically finished and will be open soon after November 15. Illumination engineers who have been visiting lighting exhibits throughout the nation state that this one is by far the most permanent and complete in the United States. All wiring is iron conduit and done just as it should be for permanent use. The reflectors are all raised and lowered by pulleys, and the main switchboard

WATER-POWER APPLICATIONS FILED WITH CALIFORNIA STATE WATER COMMISSION IN AUGUST AND SEPTEMBER

APPLICANT	Applic. Number	Diversion c.f.s.	Storage ac.-ft. an.	STREAM	Estimated Power t.h.p.	Estimated Cost	Concrete Dam	Tunnel or Pipe
J. G. Van Zandt, San Bernardino	1962	210	260,836	Santa Ana River	3000	.....	30x235x178	8 miles
C. L. Flack, Los Angeles	1968	40	.....	White Water River	1800	$100,000	12x600x600	10.5 miles
F. M. Hess, Bishop	1970	.....	500	Twin Lakes	.....	1,500	.....	.....
San Diego Consolidated Gas & Elec. Co., San Diego	1980	10	.....	Pauma Creek	560	225,000	125x900x25	2.5 miles
G. W. Peer, Los Angeles	1984	40	.....	Gold Lake	4500	.....	.....	.....
So. Sierras Power Co., Riverside	1997	4.5	.....	Alder Creek,				
		12.5	.....	Falls Creek				
		2.0	.....	Lost Creek,				
		6.0	.....	Vivian, Willow, and High Creeks — total	5793	500,000	4x10x10	5 miles
San Diego Consolidated Gas & Elec. Co., San Diego	1998	10	12,000	Pauma Creek	680	.....	6x50x10	2 miles
San Diego Consolidated Gas & Elec. Co., San Diego	1999	15	12,000	West Fork San Louis Rey R.	775	235,000	100x200x30	3.5 miles
J. H. Pierce, San Francisco	2005	5	100	First Lake	425	.....	.....	.....
	2006	5	200	Second Lake	142	.....	.....	.....
	2007	5	300	Third Lake	170	.....	.....	.....
Ed. Fletcher, San Diego	2013	50	.....	Boulder Creek	.....	.....	40x55x200	4.5 miles
C. F. Wildasim, Bishop	2017	1	.....	Mammoth Mining Tunnel	74	8,275	.....	.....
San Joaquin Light & Power Corp., Fresno	2022	200	40,000	North Fork Kings River	.....	.....	.....	.....
	2023	80	14,500	Burnt Corral	.....	.....	.....	.....
	2024	175	41,000	Helms Creek	.....	.....	.....	.....
	2025	140	13,000	Bench Valley Creek	.....	.....	.....	.....

which has been made to order is permanently installed, being a safety panel. Reflectors will be installed for the benefit of the store man. Probably fixtures of various types will be used.

U. S. S. CALIFORNIA VISITED BY A. S. M. E.

The San Francisco Section of the American Society of Mechanical Engineers celebrated the fortieth anniversary of the society, November 4, by visiting the U. S. S. California now being constructed at the Mare Island Navy Yard. Special invitations featuring the progress made in the construction of naval vessels on the Pacific Coast were issued to the members of the local sections of the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, the American Society of Civil Engineers, the American Chemical Society, the Institute of Radio Engineers, as well as personal invitations to some of the members of the Illuminating Engineering Society. Anticipating a possible attendance of 75 or 100, the list of acceptances reached nearly 300.

After arriving at the navy yard the first visit was to the cafeteria where an address of welcome was made by Captain Beach, commandant of the Mare Island Navy Yard, followed by luncheon during which several musical numbers were rendered by the employes' band and quartet. After luncheon there followed an address by Commander B. Bruce, U. S. N., Machinery Division, Navy Yard, Mare Island, on the Electric Propulsion as applied to the U. S. S. California. This was followed by an address by Lieutenant C. W. Colby (CC), U. S. N., Hull Division, on Structural Features, U. S. S. California.

The visitors were divided into twelve groups and were taken, each group by a guide over the points of interest, including the guns of the "California," the New Structural Group, Dry Docks, Machine Shop Nos. 1 and 2, the Destroyers, the U. S. S. Californa which is to be the electrically propelled sister ship of the New Mexico and the U. S. S. Montana which is just being started.

The California will be the flagship of Admiral Rodman, Commander-in-Chief, Pacific Fleet, and, in addition to the 15 officers on his staff, will carry 57 commissioned officers, and 1400 men including 75 marines.

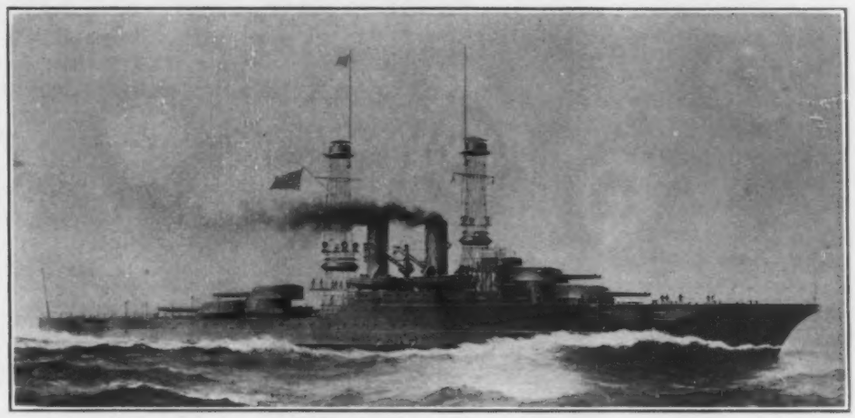
From left to right: W. W. Hanscom, chairman A. S. M. E., W. F. Durand, and Robert Sibley, editor Journal of Electricity, rallying 'round the flag.

Men of the electrical industry were pleased to learn that electricity will be used for the following purposes in addition to propelling the ship: Lighting, ventilation, steering, hoisting anchors, handling boats, and the operation of laundry machinery, dish-washing, meat-chopping, ice cream freezing, potato peeling, etc.

The armament consists of twelve 14 in., 50 cal. rifles; fourteen 5 in. rapid-fire guns; four saluting 6 pounders; four 9 in., anti-aircraft guns; one 3 in. landing gun; two 1 pounder boat guns and four 21 in. submerged torpedo tubes.

SECURITIES AMOUNTING TO OVER 45 MILLIONS AUTHORIZED IN CALIFORNIA THE PAST YEAR

The report of the Railroad Commission for the fiscal year ending June 30, 1920, shows that over 45 million of the $59,413,772.56 authorized for additions and betterments to the state's utilities during the year was granted to power companies.



The "California," sister ship of the "New Mexico," is nearing completion. It is 624 ft. long and 97 ft., 5¾ in. wide. It is electrically driven, each shaft carrying its independent electric motor which takes current from either one of two independent, turbine driven generators. There are four shafts and each shaft horsepower is 26,800. They make 175 revolutions per minute.

This sum, according to the orders of the Commission, is to be spent as follows:

Great Western Power Company of California—7% preferred stock to continue the construction of a new hydroelectric plant on the north fork of the Feather River.....$1,500,000.00

Los Angeles Gas and Electric Company—Bonds to finance general construction expenses $1,626,000.00

Pacific Gas & Electric Company—Convertible gold notes to finance construction of hydroelectric plants on the Pit River and its tributaries $10,000,000.00

San Joaquin Light and Power Corporation—$4,498,800 bonds and $3,500,000 preferred stock to complete 45,000-hp. Kerckhoff hydroelectric power plant and install a 17,500-hp. unit in its steam plant at Bakersfield; total.....$7,998,800.00

San Diego Gas and Electric Company—Stock to finance new construction $555,800.00

Southern California Edison Company—$12,500,000 bonds and $7,700,000 common stock to carry forward the construction of its hydroelectric power plant on the Kern River (Kern River No. 3), enlarge one of its Big Creek power plants, and other improvements; total.....$20,200,000.00

Southern Sierras Power Company—Bonds to pay for new properties and indebtedness incurred because of the acquisition and construction of new properties.....$1,095,538.20

Snow Mountain Water and Power Company—Preferred stock to pay the cost of constructing Gravelly Valley dam and other improvements $1,500,000.00

Western States Gas and Electric Company—Preferred stock to finance new construction.....$603,000.00

DIARY OF AN OLD-FASHIONED FARMER'S WIFE

8:00 p.m. Go to bed in dark. Tired out.

MORE ELECTRICITY NEEDED ON THE FARM

Meeting Notices for Electrical Men

(Unusually important meetings of the contractors and dealers in the Northwest and in California are reported in the following pages. The story of the recent Del Monte Jobbers' convention is told and a condensed account of the recent meeting of the Engineering Committee of the Pacific Coast N. E. L. A. is given.—The Editor.)

Combination Safety Code Discussed at Contractor-Dealer Executive Committee Meeting

The time and expense of attending meetings, the problem of bidding for government construction work, the Combination Safety Code, and the attractiveness of the electrical retail business were the outstanding subjects of discussion of the October meeting of the Executive Committee of the California State Association of Electrical Contractors and Dealers, held on the 29th and 30th at the Glenwood Inn, Riverside.

At this time the following were made members of the Association:

Goodell & Halverson, Pomona; Granger Electric Company, Santa Ana; W. J. Rainville, Willows; Glenn County Electric Works, Willows; Coalinga Electric Shop, Coalinga; Stewart Kinder Electric Co., Lodi; S. P. Good, Clovis; Townsend Electric Shop, Selma.

Extensive consideration was given in an effort to reduce the time and expense necessary for members attending the numerous association meetings which are now on the regular schedule. To this end a plan of reorganization of state work was presented and considered. This is to be reported upon in detail to the entire association at the quarterly meeting which is to be held immediately after the holidays in the vicinity of San Francisco.

A letter to the General Contractors of America has been received from L. L. Calvert, Lieut.-Colonel, Quartermaster Corps, Construction Division of the U. S. Army, asking why contractors are no longer bidding on government work. The letter states that during June bids were requested for 17 large projects, all over $100,000 and totaling $8,000,000, and only 62 proposals were received. According to the discussion of the Executive Committee, the Government does not pay enough to make this type of work worth while. Often the contractor's bid is used only as a basis for government men to figure on the project and do the work within the Construction Division without any outside help. A reply to this effect is to be sent Lieut.-Colonel Calvert.

R. L. Eltringham spoke on the proposed Combination Code and on the Licensing Law.

Development of Arizona Urged at Meeting of Citizens

At a recent meeting of the citizens of Clifton, Arizona, Senator Cameron's program for the development of the state through federal aid was received with great enthusiasm. He said:

"With electrical power developed from the Colorado River project the mines can be operated at almost one-half of present overhead expenses. The same power will also bring down into southern Arizona a sufficient current to make practical the operations of pumping plants to reclaim more than 3,000,000 acres of desert land."

BUILDERS OF THE WEST — LXXXIX

ELWOOD MEAD

Nowhere else in the world have water-right institutions been more helpfully evolved for the uses of mankind, or rural institutions been more highly developed for the advance of the people generally than west of the Rocky Mountains. To Elwood Mead, professor of Rural Institutions at the University of California, this issue of the Journal of Electricity is affectionately dedicated for his monumental work in behalf of the West, as instanced in the development of the water-right laws of Wyoming, the establishment of a successful farm settlement system in California, and the introduction of a progressive irrigation policy in far off Australia.

McMeen Addresses Los Angeles Section

"Big Things from Little Ones" was the subject of an address by Samuel McMeen, expert on public utility management from Columbus, Ohio, before the Los Angeles A. I. E. E.

Taking his theme from the centennial of the fundamental discoveries of Ampere, Arago and Davy in 1820, Mr. McMeen commented on the relative unimportance of these and similar accomplishments at the time and then their immense bearing on modern conditions. As a telephone expert, Mr. McMeen sketched the romantic history of telephony and predicted that the next few years will see startling events in this field. He was followed by J. H. Lighthipe, chief electrical engineer for the Edison Company, who entertained the gathering informally with some personal reminiscences of Thomas A. Edison.

The Los Angeles Section plans to devote future programs to the consideration of California's power program with reference to the work of the Southern California Edison Company in the Big Creek project.

Electric Railway Talk at the Seattle A. I. E. E. Meeting

The October meeting of the Seattle Chapter of the A. I. E. E. was presided over by Dr. C. E. Magnusson, of the University of Washington, in the absence of G. E. Quinan, chairman, who at the time was attending a Sales Manager's Conference held by the Stone & Webster interests in Boston.

C. Anderson, an engineer with the Westinghouse Electric & Manufacturing Company, was the speaker of the evening, giving an illustrated lecture on the "Power Indicating and Limiting System in Use on the Western Division of the Chicago, Milwaukee & St. Paul Railway." Mr. Anderson gave a clear and minute description of the system, showing by means of lantern slides the electrical circuits used, and the motors which regulate and indicate the amount of power used by the company's system. A discussion followed the delivery of this paper.

COMING CONVENTIONS

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION
Semi-Annual Meeting—Cleveland, Ohio
November 17, 18, 19, 1920

AMERICAN ENGINEERING COUNCIL OF THE FEDERATED AMERICAN ENGINEERING SOCIETIES
Washington, D. C.—Nov. 18-19, 1920

PACIFIC COAST RADIO CONVENTION
The First Pacific Coast—San Francisco, Cal.
November 25, 26, 27, 1920

A. S. M. E. ANNUAL MEETING
New York City—Dec. 7-10, 1920

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS
Annual Convention—Salt Lake City, Utah
June 20-26, 1921

Northwest Service League Endorsed at Convention of Oregon Contractor-Dealers

The all-absorbing topic and the one receiving the greatest amount of attention at the ninth annual convention of the Oregon Association of Electrical Contractors and Dealers, held in Portland October 15 and 16, was the Northwest Electrical Service League which came into being at the September convention of the Northwest Electric Light and Power Association. The Northwest Electrical Service League is the result of the work of the Northwest Electric Light and Power Association, which committee was composed of contractor-dealers, supply jobbers, electrical manufacturers and central station men, and is modeled closely after the California Electrical Cooperative Campaign and has similar objects and purposes. The League was unanimously endorsed by the Association and both moral and financial aid pledged.

Mr. John R. Tomlinson of Pierce-Tomlinson Electric Company, Portland, was re-elected to act as one of the Association's representatives on the advisory committee of the League, and Mr. S. G. Jaggar of the Morrison Electric Company, Portland, was elected to replace Mr. R. C. Kenney who found it impossible to continue to serve.

Mr. O. B. Coldwell of the Portland Railway, Light & Power Company addressed the convention on "Mutual Interests," during which he stated that central stations generally had gone out of the wiring business, had quit merchandising at a loss and recognized the fact that the contractor-dealer was a very necessary part of the electrical industry. After outlining the work done by the Advisory Committee of the Northwest Electric Light and Power Association culminating in the adoption of their report at the Spokane convention, Mr. Coldwell stated that the Executive Committee of the Northwest Association had the day before taken the preliminary steps toward raising the central stations' share of the fund for the first year's work of the League.

The Oregon Association very much appreciated the attendance of Mr. J. W. Redpath, secretary of the California Association, whose address on the subject of cooperation in California left no doubt in the minds of his hearers as to the practical value of cooperation to the contractor-dealer as well as the other branches of the industry. Some of the tangible results of cooperation mentioned by Mr. Redpath were: a 100 per cent increase in retail business during 1919 over the previous year; the increase in number of convenience outlets; that builders were being convinced that they were not building for the present but for the future and that adequate wiring must be provided to meet future electrical requirements; that as a practical demonstration to central stations that the cooperation of California contractor-dealers is more than sentiment, plans are being worked out by the California association to invest its funds in central station securities.

Fred Todd of the Pacific States Electric Company, with the aid of some specially prepared charts, covered the results of the California Cooperative Campaign, and showed what might be accomplished along similar lines by the Northwest Electrical Service League.

L. B. Smith of Portland delivered an address on "Salesmanship." He emphasized the fact that confidence is the real basis of salesmanship and business, and pointed out that dealers' salesmen should thoroughly know the merchandise they are to sell before being allowed to solicit sales.

At the Executive Committee meeting held on the morning of October 15, it was decided to propose to members outside of the Portland district, the division of the state into seven districts, thus making possible the holding of regular meetings by the members in each district. The chairman for each district automatically becomes a member of the State Executive Committee.

At the business meeting of the Association six firms were admitted to membership. The Association went on record as opposing the proposed amendments to the constitution and by-laws of the National Association which provide for the election of Pacific Coast Executive Board members and state chairmen by ballots sent out by the National Association. The Association also endorsed the plan to retain one-half of the dues paid the National Association from Washington, Oregon and California, to be used in carrying on National Association work in the Pacific Coast section.

Municipal Electricians to Meet in Colorado Springs

The 1921 convention of the International Association of Municipal Electricians will be held in Colorado Springs. It is understood that it will be held some time in October, and approximately 300 electricians from all parts of the United States and Canada will be in attendance. City Electrician Caldwell was elected vice-president of the association at the 1920 convention held in New Orleans the latter part of October.

High Voltage Transmission and Inductive Interference Among Subjects Discussed at Meeting of N. E. L. A. Engineering Committee

Under the direction of L. M. Klauber, chairman of the Engineering Committee of the Pacific Coast Division, National Electric Light Association, a meeting of this committee was held in Los Angeles November 4th, 5th and 6th.

The general purpose of the gathering was to outline the work for the coming year which terminates with the annual convention, to gather data for the various reports to be submitted at that time and to consider the best way for the members to work in the interests of the national committees following the same lines, and to which these committees, for the most part, report. It was explained that the Association is now organized in such a way that the general committees do not work with the convention of the geographical section as a goal, but rather, report to their respective national committees which in turn report to the national convention. At the same time there are other committees which were organized to consider problems peculiar to the section and these will report direct to the section convention. In the latter class are committees in Power Resources, Load Dispatching, 220,000-Volt Transmission, Relays, Licensing Engineers, and Rates Based on Power Factor.

Mr. Klauber stated that the purpose of the organization as now established is to distribute the work in order to obtain a group rather than an individual opinion and also to relieve those willing workers on whom associations of all types depended.

On account of fuel conditions in the West, as well as the insistent demand for power, it is felt that one of the most important duties of this organization lies in the work of its Hydraulic Power Committee. This branch will undertake the study of everything surrounding hydraulic possibilities, such as the relation between snowfall and runoff, the loss of natural energy due to evaporation and the most modern methods of predetermining rainfall. In this work they no doubt will be assisted by the Western sections of the A. I. E. E. which will, during this winter, devote considerable time to the same subject.

DIARY OF AN OLD-FASHIONED FARMER'S WIFE

10:00 p.m. Awakened from sleep by baby. Have to heat water on alcohol stove.

MORE ELECTRICITY NEEDED ON THE FARM

ELECTRICAL SUPPLY JOBBERS HOLD ENTHUSIASTIC MEETING AT DEL MONTE

C. C. Hillis, of the Electric Appliance Company, San Francisco, is the competent chairman of the Pacific Division, Electrical Supply Jobbers' Association.

After the Pacific Division of the Electrical Supply Jobbers' Association had met in its regular fall session at Del Monte, California, on October 21 and 22, the meeting on Saturday morning, October 23, was given over to an open session. That session proved to be of especial interest because of the part that it was shown the jobber would play in the great hydroelectric development planned in the West during the next decade.

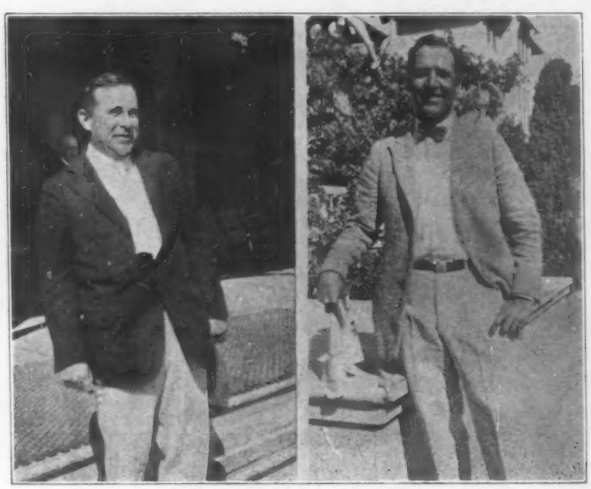
A very interesting chart had been prepared by J. M. Morris, sales engineer of the Westinghouse Electric & Manufacturing Company, on which was shown the approximate amount of materials which would be purchased for every kilowatt of hydroelectric energy generated. These estimated costs were taken in steps covering generation, transmission, distribution and utilization, and gave a good idea of the amount of electrical apparatus and material which will be required in the development already planned.

A particularly optimistic view of the electrical industry at the present time and for the future among the Pacific States was sounded by John A Britton. The amount of irrigating still to be done, the growth of industrial work, the growth of the central station industry, the developments projected by the central stations for the next ten years—all these Mr. Britton showed were indicative of the wealth which was bound to come to the Western states in the near future.

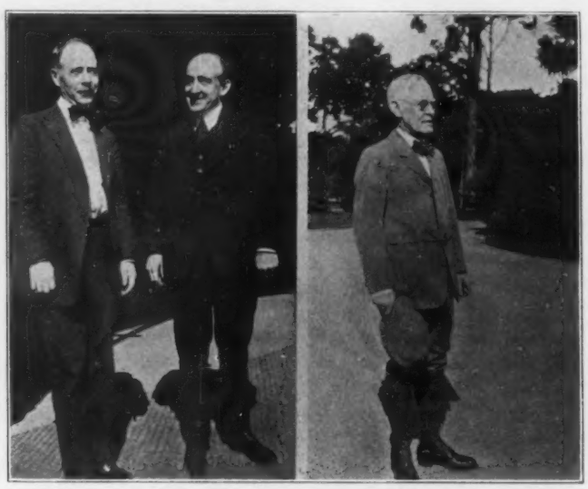
In discussing the effect of the electrical industry upon other industries, A. Emory Wishon, assistant general manager of the San Joaquin Light & Power Corporation, brought out the features whereby the electrical industry was the basic industry of virtually all of the other industries, particularly in the West, and one which would be the last to feel any depressions which might come in other industries and even then to a lesser degree.

The financing of all these immense developments was discussed by A. N. Kemp, comptroller of the Southern California Edison Company, who spoke of the creation of public wealth and of the great public wealth which he saw ahead in the West. He brought out the means whereby wealth was attracted into the public utilities, commended the recent attitude of the Railroad Commission in regard to regulatory bodies wherein responsibility goes with authority and predicted a better basis of financing for the utility companies in the future under this policy. The organization of a Speaking Bureau to carry in a voluntary way this message of the electrical industry to all kinds of organizations in the community was presented by Robert Sibley, editor of the Journal of Electricity, who mentioned in detail several mat-

Dave Harris, Pacific States Electric Company, photographed with the usual cigar, won the famous Jobbers' Cup in the golf contest.



J. M. Morris, Westinghouse Electric & Manufacturing Company, Los Angeles, at the left, presented the leading paper at the convention, but does not see why that makes him a subject for photographers. K. E. Van Kuran of the same company had charge of the meeting and has been complimented on its success.



At the left C. E. Wiggin of Dunham, Carrigan & Hayden, and F. Beck of the National Carbon Company, were caught before they had quite finished arranging their smiles. At the right is John A. Britton, Pacific Gas & Electric Company, responsible for an inspiring paper forecasting the immense industrial growth of California.

ters which should be given publicity and the mediums through which this could be accomplished. He sounded rather a personal note when he touched upon Western pioneers in the electrical industry, but showed the value of this personal factor in the publicity which should be carried on throughout the state.

To relieve the seriousness of the situation, the convention wound up with a special dinner Saturday evening at which, beside the customary speeches, there was a presentation of the golf cups to the winners of the respective matches held from time to time during the convention. T. E. Bibbins received the Turner trophy, Hal Lauretzen the Deming trophy, D. E. Harris the old copper cup and R. E. Fisher the Central Station cup.

REGISTRATION, JOBBERS' MEETING

Airey, F. J., Pacific States Electric Co.....Los Angeles
Alexander, E. G., Alexander & Lavenson Co.....San Francisco
Alvord, R. M., General Electric Co.....San Francisco
Anderson, S. B., Pacific States Electric Co.....San Francisco
Barbion, H. L., Montana Electric Co.....Butte, Mont.
Beck, F. G., National Carbon Co.....San Francisco
Booth, P. H., Edison Elec. Appliance Co.....Ontario, Cal.
Britton, J. A., Pacific Gas & Electric Co.....San Francisco
Bach, C. R., Manhattan Elec. Supply Co.....San Francisco
Berry, W. S., Western Electric Co.....San Francisco
Bibbins, T. E., Pacific Gas & Electric Co.....San Francisco
Curtiss, G. H., Elec. Ry. Mfg. Supply Co.....San Francisco
Daley, Harry H., Majestic Elec. Development Co.....San Francisco
Davis, L. W., Westinghouse Elec. & Mfg. Co.....Los Angeles
Elliot, A. H., Pacific Coast Sec., E. S. J. A.....San Francisco
Fisher, Earl, Pacific Gas & Electric Co.....San Francisco
Garbutt, H. L., Westinghouse Elec. & Mfg. Co.....San Francisco
Graham, N. W., Graham Reynolds Co.....Los Angeles
Greenfield, W. S., Allied Industries, Inc.....San Francisco
Gregory, S. B., Arrow Elec. Co.....San Francisco
Hall, C. B., Illinois Elec. Co.....Los Angeles
Harper, H. L., Western Electric Co.....Los Angeles
Harris, D. E., Pacific States Electric Co.....San Francisco
Hawley, C. B., Intermountain Electric Co.....Salt Lake City
Holabird, R. D., Holabird Electric Co.....San Francisco
Holterman, R. J., Holabird Electric Co.....San Francisco
Howell, H. D., Westinghouse Lamp Co.....Denver, Colo.
Hillis, C. C., Electric Appliance Co.....San Francisco
Irwin, A. M., Westinghouse Elec. & Mfg. Co.....San Francisco
Kemp, A. N., Southern California Edison Co.....Los Angeles
Lauritzen, Hal, Duplex Lighting Works of G. E.....New York City
Lillard, O. W., Gould Storage Battery.....San Francisco
Morris, Jno., Electric Supply & Equipment Co.....Hartford, Conn.
Murphy, R. W., McCandless Miniature Lamp Works.....New York City
Oakes, R. F. and W., National Carbon Co.....San Francisco
Parker, J. H., J. T. Parker & Son.....Parkersburg, W. Va.
Pollard, J. F., Coast Valleys Gas & Electric Co.....Salinas, Cal.
Pomeroy, J. G. (and daughter), Manufacturer's Agent.....Los Angeles
Presbrey, J. O., Ivanhoe Regent Works of G. E.....St. Louis, Mo.
Randall, H. D., General Electric Co.....Salt Lake City
Sanderson, H. E., Bryant Electric Co.....San Francisco
Sawyer, W. B., Jr., U. S. Steel Products Co.....San Francisco
Sibley, Robert, Journal of Electricity.....San Francisco
Snell, T. W., Sierra & San Francisco Power Co.....San Francisco
Steel, M. F., Benjamin Elec. Mfg. Co.....San Francisco
Stubbs, O. B., Stubbs Electric Co.....Portland, Ore.
Thompson, C. E., Westinghouse Elec. & Mfg. Co.....San Francisco
Vendegrift, J. A., National Lamp Works of G. E.....Oakland
Van Kuran, K. E., Westinghouse Elec. & Mfg. Co.....Los Angeles
Wagner, B. A., Allied Industries, Inc.....San Francisco
Wiggin, C. E., Dunham, Carrigan & Hayden.....San Francisco
Wishon, A. E., San Joaquin Light & Power Corp.....Fresno
Wolfsburg, R., Allied Industries, Inc.....Los Angeles

Contractor-Dealer Association Formed in Tacoma

The electrical contractors and dealers of Tacoma, Washington, have formed an association which is a branch of the National Association of Contractors and Dealers. David T. Dixon is president of the new organization, J. L. Fugate, secretary-treasurer, and R. R. Lang, chairman of the executive committee.

Forwarding California Industries

Two recent San Francisco meetings of the California Industries Association have featured the possibilities of wider markets for California industries. The meeting of October 28 was a joint luncheon with the Foreign Trade Club of San Francisco which was addressed by business men in touch with China and Mexico, who told of the favorable conditions now prevalent in both countries. On November 4 Sidney Levy, of the Levy Company of San Francisco, told of the practical lessons to be learned in the establishing of a manufacturing business in the West. A special program featuring the activities of the American Legion was held on Armistice Day.

Important Resolutions Passed by Pacific Coast N. E. L. A. Advisory Committee

The electrical home was an especially prominent subject of discussion at the recent meeting of the Advisory Committee of the Pacific Coast N. E. L. A. held in San Francisco, October 19 and 20.

A motion was passed requiring that a comprehensive report be made covering the activities of the California Electrical Cooperative Campaign on convenient outlets and electrical homes, this report to be in such form that it can be sent out by the Advisory Committee for the information of subscribers to the Campaign and the electrical industry generally. In order to make the position of the committee clear as to the financial responsibility to be taken for the establishment of electrical homes, the following resolution was passed:

"The Advisory Committee will not undertake to establish an electrical home exhibit in any locality unless the local electrical interests have first provided the necessary money required according to a budget prepared by a local Electrical Home Committee which has been appointed with the approval of the Advisory Committee, and which has prepared the plans and the budget for the electrical home exhibit approximately as outlined in the 'Bulletin on Modern Electrical Homes' of the Cooperative Campaign; and provided further that the local electrical interests through this Electrical Home Committee agree to pay the expenses of the electrical home exhibit as contemplated by the budget, together with any additional expense approved by the Electrical Home Committee and all other proper claims which may arise from the installation and operation of the electrical home. And also it is the sense of the Advisory Committee that it is unnecessary for the electrical industry to assume any part of the cost of advertising done by the subdivider owning the home or any part of the subdivider's expense in preparing or exhibiting the home."

Mr. Arbogast presented a letter from Mr. Spring describing the plan which the Southern California electrical contractors and dealers have evolved for the use of 15,000 of the number two wiring plan. They contemplate mimeographing on the back of these plans a list of their members.

Washington Contractors and Dealers

The annual meeting of the Washington Association of Electrical Contractors and Dealers was held in Seattle, on November 4. At this meeting officers of the association, who will serve during the coming year, were elected. V. S. McKenny of the NePage-McKenny Company, Armour Building, Seattle, is president and Forrest Smith, Boston Block, is secretary.

Public Policy Committee, N. E. L. & P. Association

The members of the Public Policy Committee of the Northwest Electric Light and Power Association for the state of Oregon have been appointed by Geo. L. Meyers, vice-president for that state. They are as follows:

R. M. Boykin, vice-president and general manager North Coast Power Company, Portland; A. B. Bower, manager Condon Electric Company, Condon; C. M. Brewer, vice-president and general manager Mountain States Power Company, Albany; C. J. Edwards, president Coast Power Company, Tillamook; T. H. Foley, vice-president and manager Bend Water, Light & Power Company, Bend; H. V. Gates, president Heppner Light & Water Company, Portland; R. M. Jennings, manager Douglas County Light & Water Company, Roseburg; J. L. Kronenberg, president Bandon Light & Power Company, Bandon; J. P. Lottridge, manager Eastern Oregon Light & Power Company, Baker; L. P. Lumpee, manager Vale Electric Company, Vale; H. F. McCormick, manager St. Helens Light & Power Company, St. Helens; L. T. Merwin, assistant general manager Northwestern Electric Company, Portland; R. J. Moore, president Yamhill Electric Company, Newberg; J. F. Orr, district manager Idaho Power Company, Payette, Idaho; J. W. Ralph, secretary Hermiston Light & Power Company, Hermiston; R. C. Reese, president Prairie Power Company, Prairie City; E. G. Robinson, president Molalla Electric Company, Canby; J. A. Ruble, president and manager Amity Light & Power Company, Amity; C. L. Shattuck, superintendent Deschutes Power Company, Prineville; C. M. Shinn, vice-president and manager Cottage Grove Electric Company, Cottage Grove; J. T. Thompson, manager Sheridan Light & Power Company, Sheridan; R. M. Townsend, Portland Railway, Light & Power Company, Portland; H. L. Walther, division superintendent California-Oregon Power Company, Medford; I. H. Watts, Preston-Shafer Milling Company, Athena.

DIARY OF AN OLD-FASHIONED FARMER'S WIFE

1:00 a.m. Awakened by rain. John falls over rocking chair while hunting for matches. Swears.

MORE ELECTRICITY NEEDED ON THE FARM

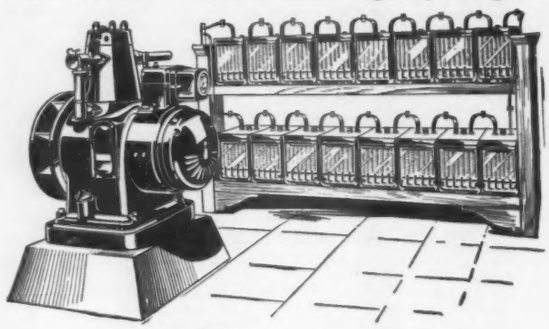
LATEST IN EVERYTHING ELECTRICAL

(The farmer or the dealer who sells to the farmer will be interested in the description of a popular farm lighting and power plant which appears here and in the presentation of a new rheostat for charging batteries. An electrically operated advertising sign invented in the West is also described here along with a new transformer, a combination switch and receptacle plant and a new line of insulating varnishes.—The Editor.)

THE WILLYS LIGHT AND POWER PLANT FOR THE FARMER

Since June, 1920, Willys Light electric light and power plants have been ordered from the Toledo factory by the Roberts Manufacturing Company, San Francisco distributors of these plants. This fact shows that even the farmer in remote districts is converted to the electrical farm idea. This type of plant is also serving as a pioneer of the electric idea in countries of the Orient.

The simplicity of the Willys Light is its most distinctive feature. It consists of an engine-generator unit and a storage battery. The engine generator is made up of a Knight sleeve-valve, air-cooled engine, a direct connected Auto-Lite generator and a simplified Auto-Lite control. A two-gallon fuel tank is located in the engine base. The kerosene, gasoline, distillate or alcohol is supplied to the mixing valve by suction.



The Willys Light electric and power plant

The generator, directly connected to the engine, has four poles and a simple shunt winding. The armature is slipped on and revolves with the crankshaft.

The battery has a capacity of 225 ampere-hours and can be charged with two gallons of kerosene. One charge will pump one hundred gallons of water every day, wash four tubs of clothes, heat the electric iron, run a vacuum sweeper and churn.

ELECTRICALLY OPERATED ADVERTISING SIGN

For displaying advertising cards in shop windows, a motor driven card display machine is being manufactured by the United Advertising and Sales Company of San Francisco, California. By this machine 24 cards of standard street car size are continuously rotating, individual cards sliding into view at definite intervals. Chains at both ends of the machine are driven by a Westinghouse type CA, 1/20-hp., 110-volt, 1750 r.p.m. motor through a horizontal shaft, worm gear and belt.

The machine originally brought out was constructed largely of wood but later dies and patterns were made whereby all parts of the machine are now being constructed of metal, making a very substantial machine.

The advertising card is changed every minute or so by this new motor-driven card display machine.

NEW TYPE TRANSFORMER

The Acme Apparatus Company, Cambridge, Massachusetts, has placed on the market a new transformer. This is designed to produce direct current at 375 volts and 550 volts. It is made in 50-watt and 200-watt sizes, for use with rectifying tubes, a small conductor on an Acme 1.5-Henry choke coil. These transformers are also provided with windings for use in heating the filaments of the rectifying tubes and the oscillating tubes which are used in the generation and modulation of the continuous wave current.

HEATER TO ATTACH ON FAUCETS

A device which heats the water as it flows through the faucet has been developed by the National Electric Water Heater Corporation of New York City. This device can either be attached to the faucet directly or by means of a rubber hose, whenever such a feature is desired.

DEVICE FOR TESTING CIRCUITS FOR CONTACTS

An instrument for testing open or short circuits in houses, factories or motor windings has been developed by the Electric Signal Manufacturing Company of Orange, New Jersey. This instrument, which goes under the name of the Emka Buzzer Tester, is in reality a combination of buzzer, telephone connection and battery in one set.

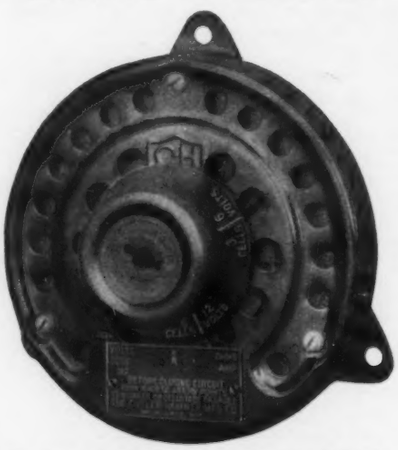
NEW LINE OF INSULATING VARNISHES

Those concerned with the manufacture or maintenance of electrical equipment will be interested in a new and complete line of insulating varnishes and japans, which have been placed on the market by the General Electric Company, Schenectady, New York. Varnishes are divided into two general classes known as black varnishes and yellow, or clear varnishes.

RHEOSTAT FOR CHARGING BATTERIES

The users of farm lighting equipment appreciate the importance of having simple charging rheostats of reliable construction for keeping their automobile batteries in good condition. The new C-H Charging Rheostat, shown in the illustration, is said to stand up exceptionally well, even under severe conditions, and is easily installed and operated.

The rheostat is connected in one of the lines from the 32-volt generating set and in series with the battery to be charged. A dial plate underneath the operating handle is marked to indicate the proper setting for charging certain numbers of cells. The handle is moved until the arrow is at the proper point on the dial plate, after which the battery circuit is closed, and the charge begins.



To charge small batteries with this rheostat, set the dial to correspond to the number of cells to be charged, and throw a switch. Used with the farm lighting plants.

COMBINATION SWITCH AND RECEPTACLE PLATE

The Peerless Light Company, Chicago, is offering a new type of combination switch and receptacle plate with removable doors. This plate is suitable for either the old type No. 1908 receptacle or the new type standard flush receptacle.

TRADE NOTES

Opportunities in South America —

The manufacturer of electrical goods is looking to South America as a fresh market for his wares. In all parts of the continent plans are being made to develop and use the potential hydroelectric power which is practically unlimited. The following tabulation of the projects which are being planned in the various countries gives some conception of the vast development which is taking place.

HYDROELECTRIC PROJECTS OF SOUTH AMERICA

Project	Location	Constructors
*ARGENTINA:		
150,000 hp. hydroelectric plant.	Falls of the Iguazu (one of the world's best single resources).	Gov. of Argentina Uruguay & Brazil.
†Power plant	Mendoza	La Empresa de Luz y Fuerza (German Co.).
Power station, extension tunnel & aqueduct system costing $5,600,000.	Falls of Rio Blanco	Municipality of Mendoza
BRAZIL:		
Power plants for and elect. of RR.	Brazil	Gov. of Brazil
30,000 hp. power plant	River Jacuhy	Bids asked for construction by Dept. Porto Alegre
Contracts for furnishing 8,400,000 kw-hr. which is being electrified		La Empresa Electra de Jandiahy and the Sao Paulo Elec. Co.
270,000 hp. power plant	Rio de Janeiro	Internationally organized company having American interests
Electrification of central Brazil RR.	From Barra to Pirahy	Gov. of Brazil
Two hydroelectric plants and inst. of street car service.	Vac. of Rio Janeiro	
Power plant and electrification of Victoria-Minas RR.	West Central Brazil	Itabira Iron Ore Co.
Construction and exploitation of high temperature furnaces, a steel factory and reducing apparatus	West Central Brazil	Itabira Iron Ore Co.
Electric smelting plant	Ribeiro Preto, Prov. of Sao Paulo	Compania Electrica Metallurgica Brazileira
BOLIVIA:		
Power plant	La Paz	
Power plant	Tres Cruces	
Power plant (cost of three: $10,000,000)	Colquechaca	
†La Paz-Yungas electric railroad	La Paz	Bolivian Government (financed by $2,400,000 loan made in U. S.)
Electrification of the Corocoro copper mines and city of La Paz	La Paz	Directors Corocoro copper mines
Two electrically operated tramways to connect Oruro and Cochabamba	Mining section of Tres Cruces	
Power and heat	Mining section of Tres Cruces	
Completion of RR. electrification and reconstruction of lines to meter width	Cochabamba-Valparaiso RR.	
Provision for electric power and heat	Mining district of Colquochaca	
Extension of RR. to Uncia	Mining district of Colquochaca	
Addition to electric line known as Cochabamba, Vinto, Cliza tramway	Cochabamba	La Sociedad de Luz y Fuerza de Cochabamba Co., capitalized at $2,000,000.
Hydroelectric plant	District of La Paz	The Guggenheims of New York
Installation of a smelting plant run by electricity	District of La Paz	The Guggenheims of New York
Founding of a town and construction of an electric tramway to it	District of La Paz	The Guggenheims of New York
Electrification of all railways in Brazil		Gov. of Brazil
PERU:		
†Electric smelter	Oroya	The Cerro de Pasco Copper Corp., Province of Juin
Provision for electric power for workingmen's homes	Oroya	The Cerro de Pasco Copper Corp., Province of Juin
20,000-kw. hydroelectric plant connection, vanadium ore reducing plant	25 mi. from Jumasha	Vanadium Corp. of America
Electric lighting plant	Portoviejo	Municipality of Portoviejo
CHILE:		
Electrification of Santiago to Valparaiso railroad. (Cost $10,000,000) ($35,000,000 Gov. loan for entire electric development)	Chile	Government of Chile
100,000 hp. plant for supply lighting and power	Dist. of Valparaiso	Anglo-Chileno-Americano
Electrification of RR. at cost of $7,500,000 and erection of power plant	Antofogasta-La Paz Railway	British owners
COLOMBIA:		
Power plant	Near the Neusa Riv.	Power company in Zipaquira
Construction of locks to provide lighting for El Espinal, Guamo and El Chicoral	La Bolso near Espinal	Irrigation interests in Tolima
Harnessing the Caroni Falls to provide power for new electric railway	San Felix on the Orinoco to the Guasipati gold fields.	

*Dr. Julius Klein, the United States Commercial Attache to the Argentine Republic, says that power plants could well be established near Salta in the northwest, near Iguazu, and in the Rio Negro district, to serve Bahia Blanca of the southeast, and that there will be a great demand for electric power for supplying the various railroads which contemplate the electrification of their lines. At the present time the Argentine railways use three-fourths of the coal consumed in Argentina.

†Now under construction.

Engineering Products Company Established —

J. A. Kinkead and C. W. Hunt, Jr., announce the opening of the offices of the Engineering Products Company in the Rialto Building, San Francisco. This company is Pacific Coast agent for Penn Iron & Steel Co.; Falls Hollow Staybolt Co.; J. Faissler Manufacturing Co.; Lovekin Pipe Expanding & Flanging Machine Co.; Hunter Saw & Machine Co.; Seminole Chemical Co., Inc.; Wm. V. Dee Co.; Hobbs Chain Co. and the Key Boiler Equipment Co., as well as exclusive agent in northern California for Collins & Webb, Los Angeles.

3,000-hp. Synchronous Motor —

The Ridgway Dynamo & Engine Company of Ridgway, Pa., have built what is thought to be the largest synchronous motor yet manufactured. This motor is rated at 3,000 hp. and wound for 2,200 volts, 60 cycles, 3-phase. It was furnished the Canadian Copper Company at Copper Cliff, Ontario, Canada, and is direct connected to a Ratteau Smoot Blower. Several other motors of this rating have been sold to South American mining companies.

Transfer of Washing Machine Company —

The assets and good-will of the Blue Bird Manufacturing Company have recently been purchased by the Davis Sewing Machine Company of Dayton, Ohio, who will continue the manufacturing and sale of the Blue Bird Electric Clothes Washer. As far as possible the old Blue Bird distributors will be retained.

DIARY OF AN OLD-FASHIONED FARMER'S WIFE

2:30 a.m. Dream of electrically operated farm. Peace.

MORE ELECTRICITY NEEDED ON THE FARM

NEW ELECTRICAL DEVELOPMENTS

(The complete electrification of a shingle and cedar siding mill, increased capacity of a power company and plans for a six million dollar terminal at Seattle show the industrial activities of the Pacific Northwest. The Pacific Central district reports unusual activity along industrial building lines with a large number of power company bond issues for new construction work. The organization of a new power company, road work and the contract awarded for a new irrigation district are some of the notes from the Intermountain and Pacific Southwest districts. —The Editor.)

THE PACIFIC NORTHWEST

LA CENTER, WASH.—The installation of an electric lighting system is contemplated for the town of La Center.

DEER PARK, WASH.—The Little Spokane Power & Light Company has changed its name to The Mount Spokane Power Company, and has increased the capital stock of the company to $100,000.

GRANTS PASS, ORE.—Application to construct a dam 85 feet in height at an estimated cost of $100,000, for the irrigation of 1,240 acres, has been filed by the Country Club Orchard Company.

BURNS, ORE.—Louis C. Kelsey, consulting engineer of Portland, Ore., and Nampa, Idaho, has completed plans for a municipal lighting plant for the city of Burns. The plant is estimated to cost $53,127.63.

PORTLAND, ORE.—Fire in the Cazadero hydroelectric plant of the Portland Railway, Light & Power Company recently destroyed two generators, oil switches and other equipment, with a damage amounting to $6,000.

THE DALLES, ORE.—This city has recently awarded to R. A. Twiss of The Dalles a contract for an ornamental street lighting system. Each light will be supported by an ornamental pressed steel pole, lights to be of 300 candle-power.

SEATTLE, WASH.—The Pacific Coast Coal Company has petitioned the King County Commissioners for permission to erect poles and wires to carry 13,000 volts of electricity from its Hyde mines to its Black Diamond mines.

PORTLAND, ORE.—The Portland Railway, Light & Power Company will construct a $4,000 temporary sub-station to take the place of its Northern Hill sub-station, which was destroyed by fire last spring. A permanent structure to cost $35,000 will be built at a later date.

OLYMPIA, WASH.—The capitol commission has awarded the contract for Class B electric fixtures for the temple of justice. insurance building and power house, to H. E. Gleason and Company of Seattle. Final award of the remaining contract for Class A fixtures was postponed for further consideration.

PORTLAND, ORE.—Application for permit to develop power on the Deschutes River in Oregon has been made by the Columbia Valley Power Company, with headquarters at 28 Nassau street, New York City. Robert O. Hayward is president of the company. The application asks permission to develop power for manufacturing and irrigation purposes.

PORTLAND, ORE.—Electrical display signs, long recognized as prime advertising requisites, are now to be used in Portland for inducing sinners to come to church. The First Congregational Church has applied to the council for permission to erect an electrical sign at Park and Madison streets, the sign to be 11 feet by 9 inches, and of approved type.

TACOMA, WASH.—The city council, when it recently eliminated the provision of a franchise with the Tacoma Railway & Power Company, which provided that the city of Tacoma should furnish lighting service to power patrons of the company at the same rate charged city power patrons, placed all power users of lighting service on an equal basis in the city.

NEW WESTMINSTER, B. C.—The city council will decide at an early date whether the city will build a municipal gas plant, or offer some inducements to the Vancouver Gas Company, or the British Columbia Electric Company, to erect a plant. A bond issue of $60,000 was voted at one time for this purpose, but the fund was used during the war years for urgent local improvements.

SALEM, ORE.—The Nibley-Minnaygh Lumber Company, a Wallowa corporation, asks for a permit from the state engineer to divert 300 sec.-ft. of water from Wallowa river, for generating electric power for the operation of a sawmill, a planer and a lighting plant. A dam of rock and earth, with spillway, timber headgate, main ditch and flume 4400 ft. long will cost $15,000.

SEATTLE, WASH.—Replying to Mayor Hugh M. Caldwell's request that an oil tanker be assigned to bring fuel oil from California, for use of the Lake Union power plant of the Seattle municipal system, Admiral Benson states that the Shipping Board will do all possible to provide a vessel. Recent early rains have saved the Lake Union plant to a great extent, and delivery of the oil may be postponed with serious effect.

SEATTLE, WASH.—Construction of a $6,000,000 ocean terminal for the Pacific Steamship Company on the 26-acre site of the former Skinner & Eddy yard No. 2 has been taken under consideration by the United States Shipping Board, owner of the property. Plans call for the construction of three 1000-ft. piers and a five-story steel and concrete warehouse and office building. The terminal will have a capacity of 325,000 tons of cargo.

RIDGEFIELD, WASH.—The shingle and cedar siding plant of the Bratlie Bros. Mill Company in this city has been completed, at a cost of $200,000. The plant is electrically operated throughout, each machine having its individual motor. The power house equipment consists of three 72 x 18 high-pressure boilers and a large Allis-Chalmers steam turbine of the Parsons type, direct connected to a generator capable of producing 1,000 horsepower. J. L. Bratlie is superintendent of the plant.

BANDON, ORE.—The Bandon Power Company, as a step in the movement for larger capacity power and electric plant at Bandon, with a dam on Willow Creek, and a transmission line of 20-odd miles to Bandon, has offered to the city its entire plant, including buildings, distribution system and machinery, for the sum of $35,000. Engineers have estimated the probable cost of the new system at $105,000, including the power company's holdings at a price of $25,000. The city has appointed an appraising board to fix the value of the present plant.

ROSEBURG, ORE.—A suit for mortgage foreclosure against the Umpqua Water, Light and Power Company was filed recently in the federal court by A. C. Chumasero and Anna McNabb Burton, two bondholders holding approximately $76,000 of the company's bonds. Co-defendants with the Umpqua corporation are the Douglas County Light & Water Company, the Merchants Savings & Trust Company, the Merchants Investment & Trust Company, the Commercial Trust & Savings Bank and the Security Savings & Trust Company, all of whom claim interest in the Umpqua corporation.

TACOMA, WASH.—In a report to the city council by City Light Commissioner Ira S. Davisson, it is stated that the net revenues for the city light department for the first nine months of 1920 exceeded those of the entire year of 1919. The light department, it is stated, is now running about $21,000 above the record of 1919 in gross monthly income. While the sale of current for the first nine months did not reach the gross receipts of 1919 by about $113,000, the operating expenses are very little higher for the greater volume of business done, and the net result is a greater amount available for redemption of bonds and improvements.

THE PACIFIC CENTRAL DISTRICT

SAN FRANCISCO, CAL.—The latest addition to the list of California public utility companies is the Nevada California Electric Corporation. This concern, which has $12,000,000 of its bonds in the hands of the public, has been previously financed through New York and Denver bankers. It is now putting out a $1,500,000 issue, the greater part of which will be placed locally by Blyth, Witter & Co. The Nevada California Electric Corporation is an 80 per cent hydroelectric concern and operates in Nevada and California. It has the distinction of operating the longest transmission line in the world.

RIVERSIDE, CAL.—Returns of Riverside citrus growers for the season of 1918-1919 just closed are estimated at $5,310,000. There were 2830 cars shipped. The crop for the coming season is estimated at about 4000 cars.

FRESNO, CAL.—The California Associated Raisin Company is planning to build offices on its ten-acre tract, to cost approximately $150,000. It is also reported that the California Peach and Fig Growers will build on the same plot.

MARTINEZ, CAL.—Articles of incorporation of G. W. McNear, Inc., were filed recently with County Clerk J. H. Wells. The firm is capitalized at $1,000,000 and is incorporated for 50 years with its principal place of business and other facilities.

VALLEJO, CAL.—An optical plant, at which all work on optical instruments of the Pacific Fleet will be done, is to be established at the Mare Island Navy Yard. This is according to Lieutenant Charles Swanberg, who has arrived from the Washington shipyards to take charge of the plant.

SAN FRANCISCO, CAL. — Great Western Power Company of California has applied to the Railroad Commission for an order authorizing the sale of $1,500,000 of general mortgage bonds, the proceeds to be used to reimburse the company's treasury for construction expenditures in connection with its hydroelectric development projects.

PETALUMA, CAL.—This city having requested it, the Railroad Commission ordered the dismissal of the city's complaint against the Petaluma Power and Water Company which was filed in the face of impending water shortage. The city alleged that the company was not using due diligence in its efforts to meet demands for water.

FRESNO, CAL.—San Joaquin Light & Power Corporation has been authorized by the Railroad Commission to execute a trust agreement securing the payment of $2,625,000 of collateral trust bonds.

SAN FRANCISCO, CAL.—The San Francisco Mint jumped a lapse of fifty-two years in efficiency when the newly installed Rennerfeldt electric furnace began operation November 9. This huge electric furnace is a drum-like metal ball fed on either side by two huge electrodes and a third entering from the top, meeting in the center and maintaining a constant high temperature sufficient to melt the rough bars of silver, gold or copper.

CHICO, CAL.—That the best means by which the municipalities may bring cheap power for municipal purposes to realization is to be found in the appropriation of undeveloped sites in the Sierra Nevada Mountains and the construction of hydroelectric power plants, is the claim advanced at the California League of Municipalities in session here November 9. The speaker was C. F. Scattergood, city engineer of Los Angeles. Some 500 delegates were in attendance at this twenty-second convention of the association.

SANTA CRUZ, CAL.—An order issued by the Railroad Commission authorizes the Boulder Creek Electric Light and Water Company, which operates in Santa Cruz county, to take over the properties of the Mountain Light and Water Company, which serves contiguous territory. The order provides for the issuance by the Boulder company of $50,000 of bonds and $5,000 of stock to the Mountain company in payment for the system. The appraised value of the properties involved in the transaction is given as $61,285.02.

SAN FRANCISCO, CAL.—Declaring that California is at the gateway of enormous possibilities, but that it will not reach the peak of development unless its natural resources are carefully fostered and utilized, the California State Railroad Commission, in a letter to Governor William D. Stephens transmitting its annual report, urges a survey of the state's water and power resources. Referring to hydroelectric power development now under way, the Commission expresses the belief that "as a result of this activity California will never again face the serious situation created by the 1919-1920 combination of extraordinary demand with minimum supply." In this connection it is urged that "steps be taken immediately whereby a complete investigation of all hydroelectric power possibilities and water storage possibilities, for irrigation and other purposes, be made in detail and such legislative action taken as will give to the Commission complete jurisdiction to direct the power developments in the state so that the most good to be public will be had."

THE PACIFIC SOUTHWEST

LOS ANGELES, CAL.—Pacific Electric Railway Company has applied to the Railroad Commission for authority to abandon and remove a spur track near Maxson Station, Covina line, Los Angeles county. The track was built to serve the Whittier Land and Water Company pumping plant when it used oil as fuel. The pumping plant is now operated by electricity.

SANTA FE, NEW MEX.—The application of the City Electric Company of Albuquerque for a franchise to build electric lines and for rights-of-way along practically every main road in Bernalillo county has been refused, with the exception of the proposed interurban line from Albuquerque to Alameda. This will be granted if the company will accept certain imposed conditions.

LOS ANGELES, CAL.—The Ontario Power Company, San Bernardino county, has applied to the Railroad Commission for authority to issue and sell $38,000 par value of its 7 per cent preferred stock at par. The proceeds are to be used to reimburse the company's treasury for construction and other expenditures and to purchase what is known as the Base Line Road pole line from the Southern California Edison Company.

LOS ANGELES, CAL.—Declaring that the present rates are non-compensatory, the Railroad Commission has authorized the Pasadena Electric Express Company to put into effect a new schedule of charges for service between Los Angeles, South Pasadena, Alhambra and Pasadena. The new rates are approximately 25 per cent higher and the schedules segregate and provide different charges for pick-up and delivery service.

LOS ANGELES, CAL.—Reconstruction work which is expected to soon provide ample electricity for the entire valley and reduce the local power difficulties has been started on the gas-electric plant of the Holton Power Company. Frederick Stiefel, construction expert of the Allis-Chalmers Company, will rebuild the 1000-hp. gas engine plant and restore it to the rated capacity. The Holton Power Company is planning to spend $10,000 on the work.

LOS ANGELES, CAL.—Frederick C. Rockwell, heading a syndicate which has applied at Salt Lake City for water rights for irrigation purposes for 100,000 acres in Kane county, Utah, has intimated that this application may be regarded as preliminary to other applications to cover greater acreages in the Utah counties bordering Arizona. Interested financially with Mr. Rockwell in the reclamation undertaking, he says, is ample capital, a majority of it from Phoenix, Arizona, and vicinity.

RAY, ARIZ.—Enough power could be developed at the San Carlos irrigation project to meet every mining need of the Ray-Hayden district, Ralph Cameron said in a speech in Ray recently. He told of a proposal for a dam and power plant on the Colorado river. He further said: "This power plant will generate 965,000 kilowatts of electricity. Mines of Arizona do not consume more than 150,000 kilowatts. The railroads will use 200,000 kilowatts, while the remaining 615,000 can be used by pumping plants furnishing water to irrigate crops on land now unproductive."

LOS ANGELES, CAL.—The Southern Sierras Power Company, which operates in the counties of Inyo, Kern, San Bernardino, Riverside and Imperial, has applied to the Railroad Commission for an order authorizing the issue of $1,040,478.55 first and refunding mortgage gold bonds. The proceeds are to be used to reimburse the company's treasury for moneys expended from income for extensions and improvements. The company also asks for authority to issue $444,260.80 first and refunding mortgage gold bonds, this amount representing 85 per cent of the cost of extensions, additions and betterments made since December 31, 1918.

THE INTER-MOUNTAIN DISTRICT

PARK CITY, UTAH.—The Keystone Mining Company is constructing a mill in Park City which will be electrically operated and will use approximately 500 horsepower.

PARK CITY, UTAH.—The Glen Allen Mining Company is building a mill which will be in service about January 1, 1921, and will be electrically operated. This mill will require about 300 horsepower.

SALT LAKE CITY, UTAH.—Cooperation of local engineering societies will be asked in working out a suitable accounting system in the handling of applications, preliminary permits, licenses and other business matters of the newly organized federal water power commission.

SALT LAKE CITY, UTAH.—The contract for digging the feed canal which will convey water from the Jordan river to the proposed power plant of the Bonneville irrigation district, has been awarded, and plans are now being gone over in detail in connection with the disposition of the $600,000 bond issue which was recently voted by the property owners in the district.

HAXTUN, COLO.—Plans are being made to build an extensive addition to its light and power plant, which is owned by the city. The present plant is too small to properly supply the needs of the fast growing town. It is planned to have the new building completed and equipment in operation by the first of the year.

SALT LAKE CITY, UTAH.—The extension of Salt Lake City's "whiteway" to State street from South Temple to Fourth, South; on Third South street, from West Temple to Second East, and on Fourth South street from State to Main is practically assured by reason of the fact that the city commission has instructed the city recorder to advertise for bids for installation of the necessary lighting system.

SALT LAKE CITY, UTAH.—The Provo Reservoir Company has installed the first unit of their electrically operated pumping plant to pump water from the Jordan river against a head of 250 feet into the Provo Reservoir Company's canal which irrigates the southwestern part of Salt Lake county. The initial installation is 800 horsepower. Their ultimate requirements will probably be in the neighborhood of 4,000 horsepower.

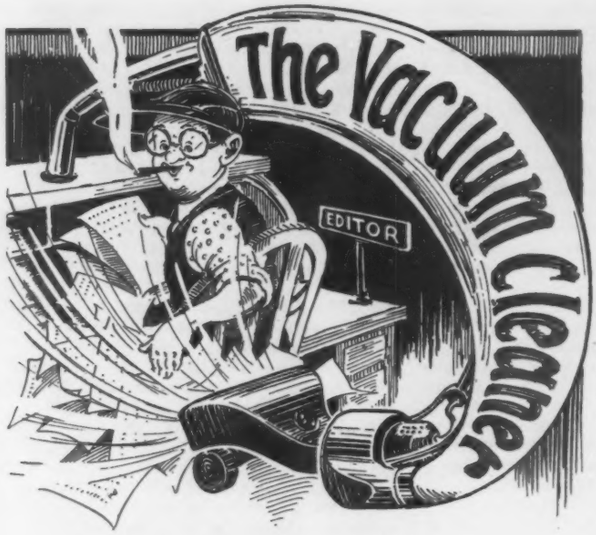
OURAY, COLO.—The Loyal Mining and Milling Company, operating the Mickey Breen properties up Poughkeepsie gulch, has been fully capitalized and Thos. P. Michell, manager of the property, is arranging to have a power line run to the mine, with a view to installing power machinery at once, if the weather permits; if not, development work will be continued by hand until spring, when the power installation will surely be made.

SALT LAKE CITY, UTAH.—Land totaling several thousand acres, included in power reserves of the intermountain country, will be thrown open to entry under the public land laws, federal officials declare, as a result of a decision of the federal water power commission. The decision provides that where land reserved for power sites will not as a result be injured or destroyed for purposes of power development, it shall be declared open to entry.

WOLF POINT, MONT.—Organization of the Listerud Power Company of Wolf Point, Mont., was recently completed and the company incorporated. The new firm will take over the business of the Wolf Point Light and Power Company. The officials are: O. C. Johnson, president; S. T. Coggswell, vice-president; M. B. Listerud, treasurer, and H. A. Shoening, secretary. With C. P. Swedborg they constitute the board of directors. Mr. Listerud will be the general manager. The concern is capitalized at $100,000.

SALT LAKE CITY, UTAH. — Considerable road paving work has been done during the past summer, and is being finished this fall, between Salt Lake City and Ogden, on the north, and between Salt Lake City and Provo, to the south. Practically all of the various contractors handling this work are using electric power, for pumping purposes, for their rock crushers, elevating machinery and mixing plants. Many of these contractors formerly used steam or basoline for such work, but have concluded that electric power is more practical and more economical.

GREAT FALLS, MONT. — Investigation of power plants, equipment, methods of distribution and other ideas utilized at the falls of the Missouri river near Great Falls, is being undertaken by J. F. Mahl, an engineer from Berne, Switzerland, who is studying methods and conditions in the Rockies with a view of utilizing them in harnessing Alpine streams and deriving electric power. Switzerland is planning to utilize all of the water power available in that country, and has sent several representatives to the United States to investigate the methods used in power plants throughout this country.



CURRENT FICTION

1. **In Conversation:**

"I called you up three times and they said you didn't answer."
"I never did that when I was a boy."
"The baby said 'Papa' quite distinctly yesterday."
"The country is going to the dogs."
"This is the wettest October we've had in thirty years."
"Something is bound to happen."
"We'd be delighted to see you any time you care to drop in."
"It makes no difference to me personally, but——"

2. **In Print:**

"This is a turning-point in the history of the world."
"One of the most popular of the city's younger set."
"Details of graft plot bared."
"The most momentous question ever submitted to the people of the nation."
"The hit of the season."
" . . . ushers in a new era."

* * *

Ideas of heaven vary with the individual; likewise ideas of the summit of success and the pinnacle of pleasure. For instance, a circular recently issued by a "write-moving-picture-scenarios" concern reads as follows:

"WORKING GIRL RECEIVES $10,000 FOR ONE IDEA
Quits Work — Lives in Ease
Gets Ten Proposals to Wed First Day
Offered Free Rides by Auto Salesmen
Importuned by Agents"

And it is not intended as a warning, but as an inducement to go and do likewise. Verily, there is no accounting for tastes.

* * *

A **"Safety Valve Club"** has been formed among a group of Eastern engineers, according to a recent report. The object of the club is to cultivate the art of public speaking. Debates will be held, and at the close of each meeting in "friendly criticism of each other's delivery, mannerisms or attitude, if these show very marked defects."

Personally we should say it would be somewhat difficult to maintain a "friendly" atmosphere during a series of remarks like this:

"Mr. Blank has a habit of turning in his toes and blinking his eyes rapidly whenever he is approaching a climax."

"Mr. Ex stutters when he gets excited. Also during his speech this evening he said 'those kind of transformers' and 'he don't'—both grammatically incorrect."

"I notice that Mr. Wy keeps his hands in his pockets throughout his speech and rises on his toes at the beginning of every sentence. Also, in spite of the fact that he is bald, he shakes his head at intervals as though he were throwing his hair out of his eyes."

The club meetings may work out excellently, of course, but we cannot help being reminded of a certain admonition we read recently:

"When a man has had his nose broken in three places he should stay away from those places."

Also we don't think the word "Safety" is especially appropriate in the title of the club.

* * *

A **contribution** to epigrams of the industry is:

"You are not a live wire merely because you sputter."

* * *

Necessity is the mother of invention in sport as well as in business. In a colored baseball game the pitches had gone rather wild, and had permitted all the bases to fill. Another man came to the bat, and the nervous pitcher shot one over.

"Ball one," yelled the umpire.
The pitcher tried again.
"Ball two," was the decision.
Another effort by the hurler.
"Ball three," said the umpire.
The pitcher saw his predicament and made one master effort to save the day.
"Ball four," yelled the umpire, "and the man's out."
"How come, I'se out?" inquired the enraged batter.
"I'se repelled to put you out, nigger. Don't you see dar's nowhere else to put you?" reasoned the umpire.

* * *

ELECTRICAL HYBRIDS — II

The Electric Fantelope

The Fantelope is rather cool—
And does not like hot air;
He's proud because he runs so fast
And has no time to spare.

MARSHALL PLAN

California water and power resources under unified control of State.

Complete utilization of all reservoir sites, both in the mountains and along the foothills.

Four main canals pool and distribute flow from all Sacramento and San Joaquin Valley streams.

Ample irrigation for five great valleys of California—Sacramento, San Joaquin, Santa Clara, Concord and Livermore.
San Francisco Bay region to receive ample water.

Four times as much water as aqueduct delivers to be provided for Los Angeles from Kern River.

Complete solution of irrigation, power, flood, reclamation and navigation problems under one project.

Twelve million acres to be irrigated, providing homes for additional millions of people, increasing land values six billion dollars, and developing an area which at the present time is served by seven power companies with a connected power load of 763,000 horsepower.

Vast power projects as storage and diversion produce new sites.

Red lines show Hydro-electric systems as follows:
Small circles: Hydro-electric power plants.
Small triangles: Steam-electric stations.
Black dots in lines: Principal sub-stations.
(Figures following names indicate kilowatt capacity.)

Transmission lines:
Wide lines: Over 100,000 voltage.
Intermediate lines: 60,000 to 100,000 voltage.
Narrowest lines: Under 60,000 voltage.
Line voltages given in figures (kilovolts) near lines.
Dotted lines: Under construction or projected for near future.

Key to companies:

1 Southern California Edison Co.
2 San Diego Con. Gas & Elec. Co.
3 Southern Sierras Power Co.
4 Pacific Gas & Electric Co.
5 Los Angeles City
6 California-Oregon Power Co.
7 Coast Valley Gas & Electric Co.
8 San Joaquin Light & Power Co.
9 Western States Gas & Elec. Co.
10 Great Western Power Co.
11 Snow Mount Water & Power Co.
12 San Francisco City.

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MAP OF
CALIFORNIA
SHOWING GENERAL PLAN FOR THE
RECLAMATION OF THE ENTIRE
SACRAMENTO AND SAN JOAQUIN

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CALIFORNIA

SHOWING GENERAL PLAN FOR THE
RECLAMATION OF THE ENTIRE

SACRAMENTO AND SAN JOAQUIN VALLEYS

TO ACCOMPANY A DISCUSSION OF THE PROBLEM
BY
ROBERT BRADFORD MARSHALL
MARCH 16 1919

LEGEND

GRAND CANALS
KLAMATH RIVER CANAL
LOS ANGELES AQUEDUCT
SAN FRANCISCO AND BAY CITIES AND LOS ANGELES UNITS

AREA BELOW 350 FEET TO BE IRRIGATED FROM RIVERS NORTH OF STANISLAUS RIVER

AREA BELOW 400 FEET TO BE IRRIGATED FROM STANISLAUS, TUOLUMNE, MERCED AND FRESNO RIVERS

AREA BELOW 1000 FEET TO BE IRRIGATED FROM SAN JOAQUIN, KINGS AND KAWEAH RIVERS.

SCALE 15 0 15 30 APPROX 45 MILES

LOS ANGELES
Redondo 40000
Long Beach 45000
San Diego 140000
SALTON SEA

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